The
Electrical Review

VOL. CXVI. JANUARY 11, 1935 No. 2981.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

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Electrical Development in Russia

THOUGH in recent years it has become the natural habit of many of our electrical men to concentrate upon the more complete electrification of Britain, that great pursuit has not prevented industrial minds from looking further afield and taking a very keen interest in a grander ultimate objective, namely, the electrification of the whole world.

If ever there was a calling which afforded ground for hope, both professionally and industrially, it is that of the designer and producer of the means essential to the supply of electricity in overseas lands. These territories have vast possibilities if the experience of the several great electrical nations is to be repeated everywhere, and the promise of the next ten, twenty or thirty years should encourage the heart of electrical men of all ages, and especially that of those who are in the comparatively early stages of their career or are just starting out upon it.

Twenty years ago there was a good deal of optimism current regarding this subject, but the consequences of the war completely changed the course of life and development in all countries. Now once again we appear to be at the beginning of a period of great advance.

The need for electrification in these other lands still exists and will do so; our recognition of that need is as clear as ever; but economic conditions have prevented both them and us from proceeding with earlier plans. Some countries are considerably advanced in meeting their own requirements, and speaking in general terms we have had to adjust our attitude in presence of a totally different situation which faces us in lands which were once prominent in our plans for overseas trade expansion.

These things by no means suggest that our opportunities are permanently lost. In some cases they are merely changed or deferred until development can become freer; in others it may mean that our efforts will be launched amid conditions suited to a far more general and rapid state of electrical application than ever before.

Thoughts such as these seem to us to be appropriate to such an occasion as the present, when the great electrical activity that has been proceeding in the Soviet Union of Russia is being placed before members of the Institution of Electrical Engineers in London and at its provincial centres by Mr. Allan Monkhouse. The paper which we abstract later in this issue, though prepared more than a year ago, has been for special reasons deferred until now, but the information contained in it was revised by the author in September last, and is deserving of close study.

We have from time to time published various reports concerning electrical "five-year" and other plans, and frequently we have refrained from publishing statements of progress, because of uncertainty as to their reliability, but in Mr. Monkhouse's review of the position we are able to learn from one who has unique first-hand knowledge of what has been proceeding. His statement will be welcomed by everybody on that account. No doubt there is a great deal more that he could tell for general guidance; in any case, members' contributions to the discussions should be both instructive and interesting.

The maps used to show the developments that are in hand or in contemplation are quite impressive regarding the immensity of things, and we may also select three statements of special interest:—first, that the total number of employés in the electrical manufacturing industry is about 115,000 persons; second, that the Soviet Government intends to electrify 3,800 km. of railway line *before* 1937 (it is already 1935!); and third, that the authorities are rapidly building up for themselves an electrical manufacturing industry capable of supplying their own requirements.

On this last point it is hardly to be expected, if we judge from some chapters in past experience, that Russia will be able for some years to come, if ever, to show complete independence of this and other electrical and engineering manufacturing countries. Her plans may be carefully laid, but plans are not everything. Her engineers, scientists and organisers are not blind to the things she lacks.

A Good Start

A WEEK or two ago we expressed the opinion that 1935 would witness the execution of important work which would bring orders to the electrical industry. Last week two welcome developments were announced. The first is of a purely electrical nature—the expenditure of £418,000 by the London Power Co. on boiler plant for the Battersea and Willesden stations. The other is the decision of the Southern Railway Co. to effect considerable improvements, costing £500,000, at the Waterloo terminus. This scheme involves alterations in the arrangement of the electrified tracks and the installation of colour-light signalling on an extensive part of the system. Another matter of interest in this connection is the presence in this country of representatives of the Soviet Government with a view to the ordering of textile machinery to the value, it is said, of over half a million pounds. This is bound to include, or necessitate, a good deal of electrical driving and control gear, in which British manufacturers should secure a good share. If the year goes on as it has started the prospects are bright.

The Heating of Exposed Cables

THE economy of running a cable above ground is subject to many qualifications. Thus the more rapid dissipation of heat in soil than in still air has resulted in the use of copper of heavier cross-section in exposed loops into sub-stations. The effect of exposure to the sun is far more pronounced, and in a notable contribution to the I.E.E. *Journal* Mr. E. B. Wedmore (director, Electrical Research Association) shows that, even in this country, for cables with diameters of 2½ in., the loading may have to be reduced to offset a temperature rise of 17 deg. C., which must be deducted from the permissible rise of 50 deg. Results obtained in places as far distant as London, Milan, and Buenos Aires are in close agreement and show convection to be the most important influence. An empirical factor, varying with the cable diameter and air velocity, has been successfully applied to lead-covered cables. The relationship has not been so definitely established with regard to armoured cables, but the practical value of such information should adequately justify further investigation.

Indian Hopes

THE political aspect of India has been so much before us lately that the commercial position has been somewhat obscured. Now, however, we have the annual report of Sir Thomas Ainscough, Senior Trade Commissioner, to remind us that trade is, after all, one of the great links between us and India. The economic conditions which have prevailed during the last few years, combined with the anti-British boycott, have had serious effects upon British manufacturers, but now there are indications of improvement in general affairs, while the boycott seems to have been dropped, or at least considerably diminished in intensity. Accordingly there are good grounds for believing that better times are in sight, and Sir Thomas Ainscough's report reinforces this belief. He anticipates that a halt in trade decline will soon be made, and that electrical developments which have been held in suspense will go ahead shortly. Although Great Britain secures over half of the electrical import trade, there are strong competitors in the market, and it is essential that the local representation shall be strong, and, as we have so often advocated, given a fair measure of freedom in negotiating contracts. Apart from the strictly electrical potentialities, communications offer a growing scope, and there are signs of important developments in the radio and telephone field.

Use More Electricity

A CORRESPONDENT to a London daily newspaper complains that 8d. per kWh is charged for lighting within fifty miles of London. Of itself the statement provides no criterion as to whether such a rate is justifiable or not. The real point is: Does the undertaking in question offer as an alternative a two-part tariff, with the necessary facilities in the way of hire of apparatus and assisted wiring to make it operative? In the Greater London area a charge of 8d. per kWh. is made by several authorities in outlying districts, but the average price for domestic supplies (including lighting) is less than 1.6d. per kWh. The writer of the letter thinks there must be something wrong, having regard to the increased consumption referred to in the Electricity Commissioners' annual report, but a consumer who uses electricity for a few lights only is doing practically nothing towards advancing the output, and cannot reasonably complain if (asuming the proper inducements are offered by the undertaking) he does not share in economies of production that are due to the support given to the supply undertaking by others.

Sulphur Eliminated

THE announcement that the disparity between the turbine and boiler capacities at Battersea power station is to be corrected by the installation of three 375,000-lb.-per-hr. boilers is presumably to be read in conjunction with the favourable report of the Government Chemist on the sulphur elimination plant employed there. During the first year of its operation Dr. S. L. Pearce and his chief chemist, Mr. Hewson, have achieved results that seem fully to justify the claim of the London Power Company to have solved the problem of power station emissions. The company has this amount of compensation for its expenditure of £250,000 on the washing plant. Such a cost could have been incurred only in connection with a large power station, and this gives support to the claim that a widespread use of electricity provides the most effective means of combating the evils of smoke.

"L'Atlantique"

AFTER declaring that the destruction by fire of the liner *l'Atlantique* could not be attributed to an electrical origin, the Court of Appeal in Paris stated that, even if electricity were responsible, the existence of undisclosed defects in the installation would not have invalidated the policy. It was also proved that apparatus alleged to have been supplied with electricity by faulty cables was not in use on the night of the fire, and that this, therefore, could not have contributed to it. The underwriters have the right to lodge an appeal with a higher Court, but only on a point of law. The point of fact that the cause of the fire was not electrical has been established.

Manx Transmission Lines

THE Isle of Man Electricity Board supplies electricity in sparsely populated country, and Douglas, the only large centre of a kind that elsewhere usually has to bear the charges in the initial stages of rural development, is excluded from its area. Yet Mr. J. P. Tucker, the engineer, has not had recourse to a deficiency rate, despite the existence of gas undertakings and the absence of any large block of users. From the correspondence columns of a local paper it appears that the undertaking is undergoing the usual criticism regarding the alleged unsightliness of overhead lines. One writer takes the practical view that he prefers electricity supplied by pole lines to contributing towards a deficiency rate of five shillings in the pound, which the use of underground cables is said to entail. The tendency to draw a distinction between utilitarian and æsthetic values is, however, to be deplored. The latter are frequently confused with the self-consciously antique (or antiquated), which if they are well-designed to fulfil a useful purpose they have a functional merit that comes to be more highly esteemed as we get used to them.

Tail-piece

AN original argument against overhead lines was advanced at a local council meeting last week, when a member said that they were sterilising the district. If this be true the lines will eventually fall out of use and disappear, and that problem will be settled.

Architectural Lighting

By R. O. Sutherland, A.R.I.B.A.

The urgent need for an appropriate technique of design

GOOD architecture embraces the proper planning of services such as heating, ventilation and lighting. Possibly it is not sufficiently realised by the great body of those who come into contact with architecture, both the technical man and the layman, that such services, so essential to well-being, are as much a subject for good design as the arrangement of rooms and the planning of the façades of buildings. There appears to be a tendency to estimate the merits of design disproportionately at the expense of other vital considerations.

In illumination alone the field of possibilities unfolded before the eyes of far-seeing designers would almost overwhelm the imagination were it not for the tempering influence of cost, which unfortunately limits the view by the length of the purse.

Casting around for some ally that will assist to bring within reach the vast potentialities of illumination in architecture, one realises that the development of a suitable technique more than anything else will be the deciding factor in lighting design so that artistry and practicability may be united.

In the exercise of a technique that is acceptable to both architects and engineers there will be found a medium that will establish the proportionate claim of lighting which has a purely service value to provide and lighting which exists solely as a means of decorative expression. Between these extremes lies the whole scope of illumination in architecture for buildings whose purposes range from industrial to entertainment interests.

So long as the lighting is fitted to the purpose of the preconceived design of the building it is architectural lighting. Good architecture postulates good lighting; where illumination is not suited to the design, then the architectural merit fails by this margin. When the matter is analysed in the cold light of logic it must be appreciated that artificial lighting is undeniably a necessity of present-day requirements in buildings. As far back as records will take us, the history of architecture has been influenced by the light of the sun.

In the present day interest in the science of orientation in building has become intensified, and, in the future, "Design for Living" promises to be guided by the effect of daylight on well-being as much as ever it was in the past. But only now is it being gradually appreciated that artificial illumination is destined to exert a very considerable influence in architectural design for the well-being of posterity in matters of health, service and æsthetic satisfaction.

A high standard of technique should be developed before the day, perhaps not so far distant, when electrical energy may be available at cheaper rates.

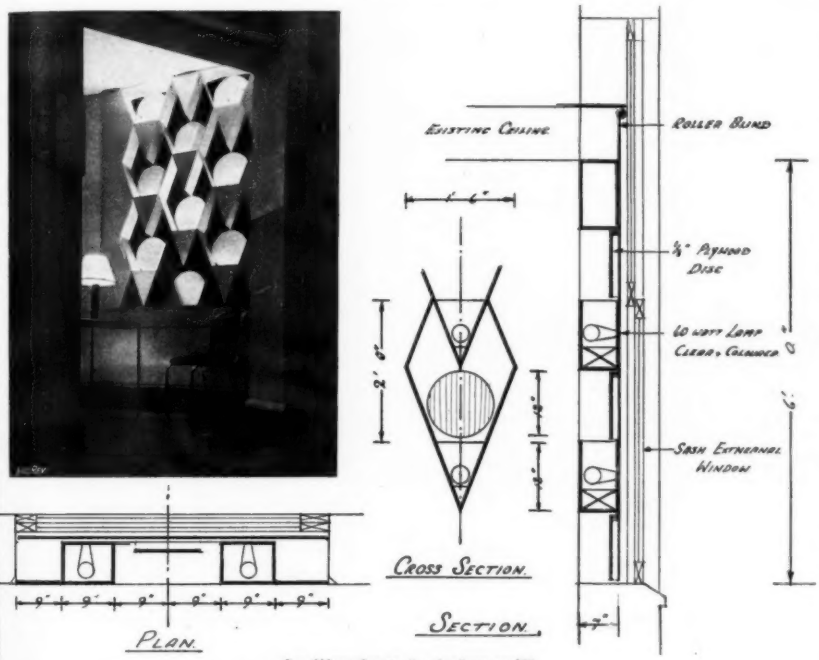
Meanwhile it will be necessary to have established principles of a technique that will ensure a standard of illumination which will lead on to high cultural attainments. In the absence of such forethought it would not be difficult to conceive a liberal use of lighting, which, being uneducated, will be vulgarised to an extent that would discredit all those to whom good illumination and architecture is an ideal.

Mr. R. O. Sutherland is on the staff of the Lighting Service Bureau

Architectural lighting, or preferably light in architectural design, has been described as systems of lighting which utilise luminous or illuminated surfaces as an essential part of the design of buildings and for which the requisite equipment is either built in or on to the structure as an integral part. Such luminous surfaces are lighted panels, beams, &c., in those indirect systems in which walls and ceilings are reflecting mediums.

The design of these surfaces presents a wide field, but my immediate concern is in the technique of lighting and an analysis of an aim and influence which achieves results that may be said to produce a building in a state of illumination rather than one furnished with light. Preferably, technique in architectural lighting consists in the ability to produce lighting in accordance with the best standards of illuminating engineering by an expression in design which conforms with the best architectural practice.

The illuminating engineering aspects take account of such matters as the direction of light, qualities of transmission and diffusion of glasses, the consumption of energy and preservation of lamp life, together with the design and use of reflectors and other problems of height, distance, mounting and spacing to produce evenness of illumination. While there are other matters which are of importance, the points enumerated can be described as the main factors.



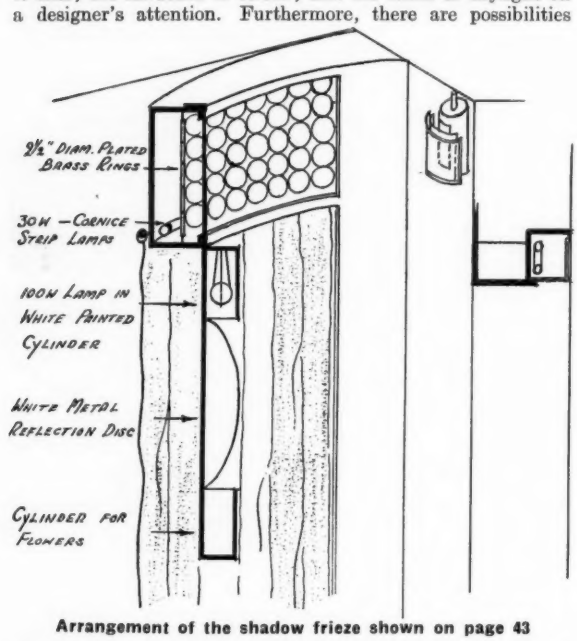
An illuminated window grill

A treatment of a window which shows how a decorative character is imparted under both natural and artificial lighting conditions. A black blind at the back, when released, allows penetration of sunlight, when the pattern of lamp casing and reflection surfaces becomes a silhouette. On the lowering of the blind, the coloured lamps give an arresting design of coloured light pattern suitable for amusement palaces, shop exhibits, and exhibition purposes.

A shadow frieze

A feature which employs the use of chromium-plated rings arranged four inches from the background, and flooded on each side by 250-W projector lamps with a green and red screen respectively. The resultant effect is to produce an interlocking pattern of red and green shadows from the rings, which also become decorative through specular reflection of red and green light. The dark spots are mirrors which give a coloured spot shadow.

What, then, of the architectural aspects? They refer to the actual presentation of light from the surfaces of buildings and the means of doing this; the forms, the colour, the materials from which illumination emanates and upon which it falls; the influence of colour; and the claim of daylight on a designer's attention. Furthermore, there are possibilities


2½" DIAM. PLATED BRASS RINGS
30W — CORNICE STRIP LAMPS
100W LAMP IN WHITE PRINTED CYLINDER
WHITE METAL REFLECTION DISC
CYLINDER FOR FLOWERS

Arrangement of the shadow frieze shown on page 43

in using lighting equipment as basic elements which can take their part in an architectural composition. Briefly, the technique of illuminating engineering is devoted to the primary source of light which is responsible for the secondary source of light from a surface which is the architectural presentation of illumination.

The foregoing remarks relate to existing influences in technique as regards the two specialists concerned, but it is not enough to leave this subject at this point. A designer is much in the position of the conductor of an orchestra; he must anticipate movement, and he must be born with the ability to sense the requirements of the immediate future and make provision, from dependable imaginative resources, for the demands that will arise during the life of his work. This quality, or gift, can be made more reliable by an ability to use his technique to produce stimulating effects, not necessarily novel but essentially progressive.

There is, for instance, the possibility of a technique in architectural lighting design where greater attention is given to the lower areas of walls, for it is at that section of the room that reflected light can be put to its greatest uses. Activities range about the height of the human figure; thus lighting from floors upon walls cannot be regarded as unreasonable, provided glare and beam nuisances are eliminated.

In a different field there is a growing demand for a decorative fitting of a quality that will receive the respect of future generations of designers. As each day goes by there is a perceptible and increasing demand for colour in artificial illumination. The practice of including a flame-sprayed lamp to give added warmth to lighting is becoming increasingly popular in this country where grey days are only too common and among people who are now able by the facilities of travel to appreciate the benefits of bright sun and warmer climes in Southern countries. Psychological benefits are not only bestowed by colour, but also by halation; brightness derived from light upon or through glass is found to be almost a necessity in many indirect lighting schemes in order to allay the sense of depression that is otherwise experienced.

Meanwhile there is a promising future in the development of a technique of producing decorative patterns or images by the passage of light from a primary source, such as a lamp through translucent screens, or fantasies of decoration by specular reflection from polished surfaces. Many designers realise that where there is directional light there is always shadow, and it is possible to foresee an era in design where beauty will be derived from the disposition of colour shadows.

It is only necessary to study the parallel of sunlight to realise that in artificial lighting shadow is a means of expression, and contrast has been sadly neglected. Ultimately it will be realised that the technique of architectural lighting does not affect the interior only of a building. While it concerns every part of the equipment within, such as furnishing, and is associated with other sciences, such as heating, ventilation and acoustics, it also concerns everything without, such as the treatment of façades (including a restraint upon lighting advertisements) and everything about a building, and the approaches and gardens of streets and towns also.

Domestic and Agricultural Supply in Italy

THE framing of electricity supply tariffs in Italy, says J. Rautenkrantz in *Elektrotechnische Zeitschrift*, is influenced on the one hand by the demand for cheaper energy and on the other by the desire to maintain a reasonable return on invested capital. Electricity for lighting in Genoa, Milan and Rome costs from 7¼d. to 8d. per kWh, about 35-45 per cent. of this amount being made up by taxes, which are not charged on supply for domestic services. Allowing for reductions in capital costs and charges, it is estimated that energy should be available at 0.26d. at hydro-electric stations and 0.9d. or 1.0d. per kWh at the consumers' terminals, including transmission and sub-station costs and losses.

The use of domestic electrical appliances is increasing rapidly, stimulated in many districts by vigorous publicity, easy-payment schemes and preferential tariffs. Electric refrigerators, mostly of American origin, have recently been installed in a number of private houses. Hot-water storage installations are very popular, many of these being rented and supplied with night-current at a fixed charge per quarter. Complete statistics are not available, but it is estimated that there are :—

	Number.	Connected kW.
Electric cookers... ...	60,000–70,000	130,000
Water heaters	15,000	12,000
Refrigerators	8,000	7,800

The total consumption for domestic purposes is about 120 million kWh per annum, and it is estimated that it would amount to 1,500 million kWh if domestic electrical appliances were used in 10 per cent. of Italian households.

In Rome the demand for electric cooking shows two peaks daily, one at midday amounting to from 27 to 36 per cent. of the installed kW, the other in the evening amounting to from 11 to 25 per cent. of the installed kW. The cooking load is switched on for about 1,200 hr. per annum at midday and 2,100 hr. per annum in the evening. The daily consumption is slightly over 1 kWh per person for cooking in Rome; the corresponding figures for the Ancona asylum with 875 inmates, 252 feeding together, is 0.5 kWh per person per day. Where 10 per cent. of the consumers have electric cookers and 15 per cent. use hot-water storage, the central station output is about three times that for lighting alone. The increased consumption due to broadcasting is about 70 kWh per consumer per annum.

Much attention is being devoted to the electrification of agriculture in Italy, with particular reference to the economic difficulties of ploughing and threshing in the field, for which purposes the supply lines are only in use for a few days per annum. An official commission, including agricultural and electrical experts, is conducting systematic investigations in seven areas (totalling 16,200 acres) in different parts of Italy. Considerable progress has been made with electrical irrigation, but electric ploughing is in a less advanced state and the desired "complete electrification" is not yet attained in any of the experimental areas.

Important work has been done by the Soc. An. per l'Elettro-agricoltura on a sparsely wooded tract of 24,700 acres, divided into farms of 247 and 494 acres mostly growing grain, only 2,470 acres along the coast being under vegetables. A 10-kV line, about nineteen miles in length, is carried by wooden poles and this feeds a multi-branched network to which mobile transformer stations can conveniently be connected. Grubbing and clearing operations, breaking up the ground to a depth of 20 in. require from 110 kWh per acre in light soil to 182 kWh per acre in hard ground. According to the nature of the soil, ploughing 10 in. deep requires from 24 to 45 kWh per acre. Threshing consumes from 0.58 to 0.61 kWh per cwt.

In addition to these loads, many irrigation plants have been installed in the district concerned. During the year ended September 30th, 1932, the total consumption amounted to 200,000 kWh and the load at no time exceeded 200 kW. A profit was realised during the first year's operations and this was applied to further developments.

As in other parts of the country it is found that the capital charges on lines, rather than the energy cost per kWh, is the determining factor. In the case of two farms of 280 and 38[illegible] acres respectively, the cost of electrical operation, including fodder preparation and dairy work, is about 32s. 6d. and 21s. 3d. per acre, compared with 52s. 10d. and 41s. 7d. per acre before electricity was adopted.

Electrical Developments in Russia

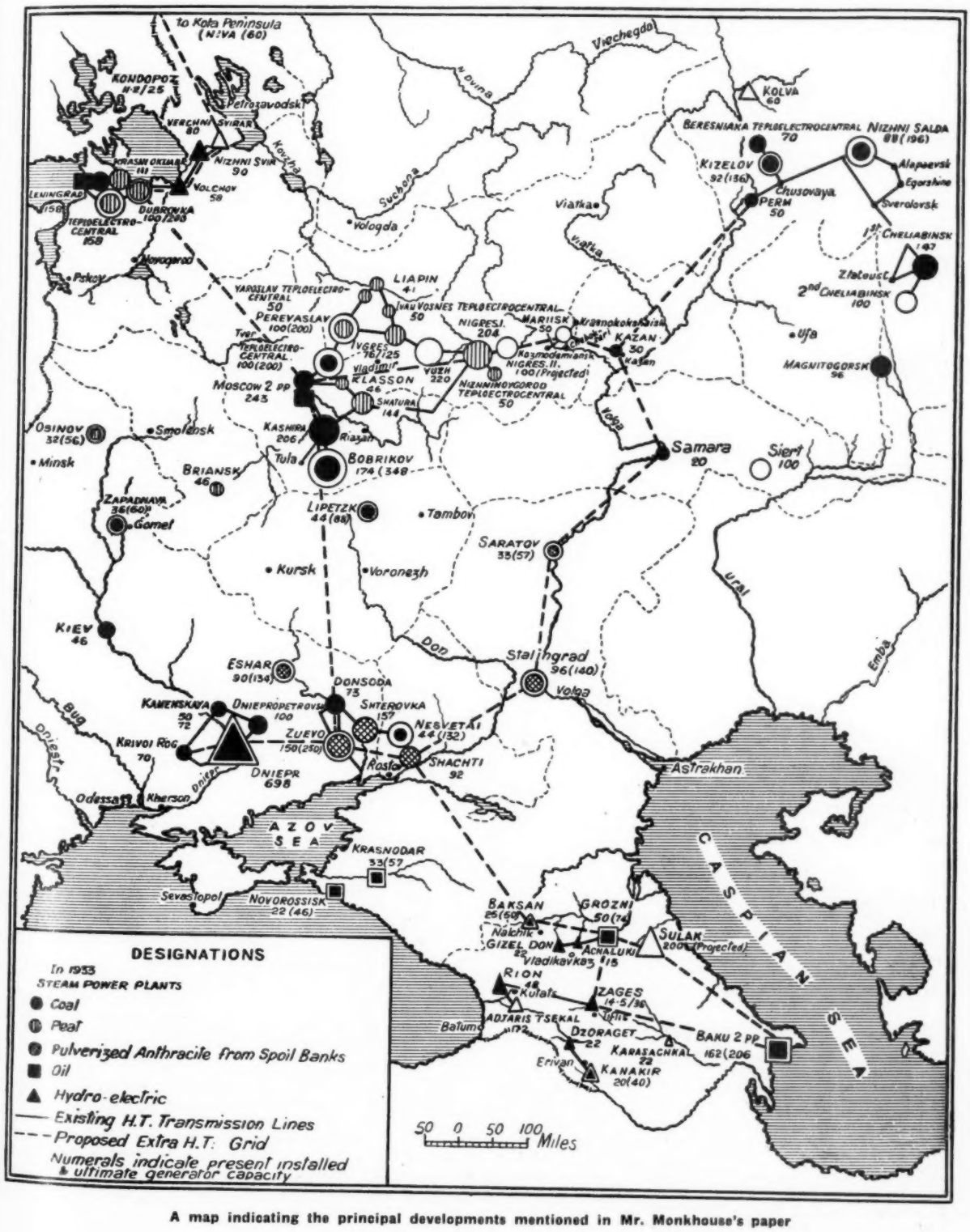
An authentic review of the situation

THE growth in the use of electricity in the Union of Soviet Socialist Republics in connection with the industrial development schemes of the Government is outlined in the paper by Mr. A. Monkhouse that was read at the Institution of Electrical Engineers in London on January 10th.

The paper is largely descriptive and statistical; it is not a commentary. Details are included of the use of peat fuel in large power stations, together with particulars of "thermal-electric" plants which are being built in many parts of the Union and of hydro-electric developments. The outputs of ten stations in which British plant is installed are stated, while particulars, with drawings, illustrate the trend of general plant layout. Details are given of a typical station designed for 250,000 kW, four of which are now under construction.

The standardisation efforts of the Soviet authorities in relation to generation, transformation, and transmission equipment are outlined, and the paper terminates with brief references to electrical manufacturing developments, railway electrification, and research.

From 1923 onwards the construction of fifty-six large power stations and over 8,000 miles of 110-, 115-, 160- and 220-kV overhead lines, with their distribution sub-stations, is considered by the author to be one of the most spectacular developments in a country where rapidly growing industrial activities as a whole have attracted the world's attention. Control of these activities has passed through many changes; at



A map indicating the principal developments mentioned in Mr. Monkhouse's paper

present it is concentrated in a special section of the Commissariat of Heavy Industries, known as "Glavenergo," which is responsible for approximately 65 per cent. of the generating plant and practically the whole of the transmission and distribution systems.

The energy generated in 1933 totalled 15,855.8 million kWh, an increase of 2,465.6 millions compared with 1932. Of the total, Glavenergo stations produced 64.5 per cent., industrial stations 29 per cent., commercial stations 4.9 per cent., agricultural stations 0.6 per cent., and transport stations 1 per cent.

The majority of the stations not under Glavenergo control are those of large industrial plants, including the Magnitogorsk steelworks (48,000 kW), Kuznetsk steelworks (72,000 kW), Beresniki chemical works (83,200 kW), Baku oilfields (154,900 kW), and Grosni oilfields (32,400 kW). The Glavenergo output has grown from 750 to 11,079.5 million kWh in the last ten years. In this group are sixty-two straight condensing stations, nineteen pass-out heating stations, and twelve hydro-electric plants. Their total installed capacity is 3,411.2 thousand kW, and in addition to the electricity generated, 2,449.9 mega-calories were supplied for heating purposes.

The plans of the State Commission for the Electrification of Russia ("G.O.E.L.R.O.") appointed in 1921 have departed from established European practice. In the first place the industrial districts of North European Russia, *i.e.*, Leningrad, Moscow, the cotton manufacturing district centred at Ivanovo Vosnesensk and the Gorki (Nijni Novgorod) district, where many large engineering works are being established, are far removed from the bituminous and anthracite coalfields of the Ukraine or the oilfields situated on the shores of the Caspian Sea. For economic and strategic reasons it was considered necessary to make these northern industrial areas independent of fuel supplies from the Ukraine and Caucasia, and attention was therefore concentrated on the development of stations burning peat and brown coal.

Peat-burning Power Stations

Approximately 42 per cent. of the world's peat resources are located in the U.S.S.R. The majority of this peat is in the northern districts of European Russia, and it is calculated that some 30,460 million tons of fuel (converted to tons with a calorific value of 7,000 calories/kg) are available south of the 60 deg. latitude line. North of this line the vast peat resources of the tundra have as yet only been partially surveyed. Not until the Makarev shaft-chain grates were tried in 1920-1921 were boiler-house efficiencies obtained which were comparable with those observed in the best coal-fired boiler practice. The results obtained were sufficiently good to justify proceeding with a large station at Shatura, which now has an installed generating capacity of 136,000 kW.

At the Dubrovka station (100,000/200,000 kW) near Leningrad, recently completed grates of this type are used. They are a combination of gas producer and chain grate; peat is fed downward from bunkers, heated air being forced through the upper part, which becomes incandescent. The more volatile constituents pass through openings in the rear arch into the main combustion chamber. Moisture is converted into water gas, which is also burned; dry peat is moistened to 32 per cent. The final burning of the residual peat takes place on the chain grate.

There are now seventeen peat-burning stations with a capacity of 1,053,000 kW; by 1937 there will be forty-one with a capacity of 3,628,000 kW.

Of the eighty-one stations reporting to Glavenergo (2,822,600 kW), about 30 per cent. operate on peat fuel. Several ways of winning and treating peat are described in the paper, to which subject a great deal of attention is being devoted.

Coal and Heat Supply

Moscow has partially solved its power-station fuel problem by utilising an extensive brown-coal deposit which lies about sixty miles south of Moscow. The Soviet Government has built a large power plant on this brown coalfield at Kashira (186,000 kW); and at the present time a very large chemical fertiliser plant, which will also supply a large quantity of power to the Moscow network, is under construction at Bobriki (200,000-400,000 kW) on this coalfield.

In the Ukraine and the mining districts of the Don basin, G.O.E.L.R.O. has devoted its attention to utilising the anthracite-waste spoil-banks which had accumulated over a period of many years in the coal-mining districts. The power stations at Shterovka (152,000 kW), Zuevka (150,000-250,000 kW), Stalingrad (51,000-140,000 kW), Saratov (22,500-57,000 kW), and Schacti (Artem) (66,000-92,000 kW), all of which have been put into operation during the last ten years, are operated on pulverised anthracite-waste and are giving satisfactory results, although the thermal efficiencies obtained have not entirely fulfilled expectations.

The building of new industrial cities and the rapid planned development of existing cities have provided an excellent opportunity for the introduction of schemes involving the use of pass-out turbines, the steam from which is utilised for process work in factories and for heating water for circulation over a wide area as a heating medium. Large areas of the cities of Moscow and Leningrad are heated in this way; new "thermal-electric" stations are being built to serve the new residential districts and industrial towns. Details of the circulating pipework and temperatures are included in the paper. "Thermal-electric" stations over 10,000 kW in capacity number twenty-two and total 845,200 kW.

A recent effort to reduce fuel consumption has resulted in the average consumption of the steam stations reporting to Glavenergo falling to 1.55 lb. of fuel per kWh output, compared with 1.76 lb. in 1932.

Hydro-electric Developments

The absence of high-head sites from the vicinity of industrial areas has decided the Soviet Government to build a series of large low-head hydro-electric stations on the great rivers of European Russia, which are being developed to form the basis of a comprehensive inland-water transport system. The dam built on the Dnieper, and those now in hand on the Volga and the Svir, are being built with the dual object of providing cheap electric power and of making the river navigable for large vessels.

The Kamishenski dam on the Lower Volga is primarily destined to supply power for irrigating 8 million acres of the rich soils lying to the east of the Volga. The water will be pumped from the river itself by fifty-nine pumping stations having a total installed pump-motor capacity of 1,244,015 kW. The largest pumping station will deliver approximately 500,000 cu. ft. of water per minute against a head of 190 ft. The motors at this station will develop a total of 213,500 kW. Vertical pumps will be employed, and it is suggested that each of these should have a rating lying between 45,000 and 75,000 h.p. These figures are quoted from the preliminary plans of the Central Planning authorities recently published in Moscow, in order to give some idea of the magnitude of the Lower Volga irrigation scheme.

The first water-power station to be built was that on the Volhov River, of 10,000 h.p.; the 1932 output was 439,900,000 kWh. The most important completed low-head scheme is the Dnieper, with nine 94,700-h.p. sets generating at 13,800 V and stepping up to 161 kV. Other low-head water-power schemes are the Svir River, three stations, four 37,500-h.p. sets, ultimate output 550 million kWh; Zemcho-Avchal (Kur River), four 3,600-kW sets, ultimately 36,000 kW; Rion River, four 17,200-h.p. sets, ultimately 240 million kWh; Niva River, four 15,000-kW sets, ultimately three stations: Kondopog, two 5,700-h.p. sets, ultimately 25,000 kW; Middle Volga, three stations to aggregate 1,000,000 kW; Kamishinski (Lower Volga), probably an open-air station with twenty 60,000-kW sets.

High-head stations in the mountainous districts of the Caucasus and Central Asia include Kanakir, two 15,000-h.p. sets, plus two 48,000-h.p.; Dzoraget (also feeding the Armenian network), three 10,500-h.p. sets; Adjaris-Tsekhal (on the Turkish frontier), 23,500 h.p. and 105.3 million kWh; Leninakan, five 1,500-h.p. sets, the bulk of the output going to Armenia; Giseldon, three 7,500-kW sets; Ulba (the first of a number in central Siberia), three 13,000-h.p. sets supplying the Ridder zinc mines; and Chirchik, two stations to contain four 60,000-h.p. and four 40,000-h.p. sets, designed to produce nitrate fertilisers for the cotton fields of Central Asia and also providing for the irrigation of 1,250,000 acres.

Operation and Design

In 1932 the average cost in seven generating districts was 5.768 copecks per kWh generated. Fuel represented 2.459, wages and social insurance 1.189, sundry costs 1.247, and interest and depreciation 0.873. In six of the seven cases the actual cost exceeded the planned estimates. At the exchange rate ruling in 1932 the average approximated to 1d. per kWh, but the purchasing power of the copeck in the U.S.S.R. was between 0.25d. and 0.35d.

During the last two years definite attempts have been made to standardise plant and layout; details are tabulated in the paper, and the specifications differ from those of the International Electrotechnical Commission. The voltages now in general use are 6.3, 10.5 and 15 kV for local distribution and 35, 110, 154 and 220 kV for transmission, while generating voltages are increasing. Wayleaves are of minor importance, so that line towers have large base areas; lower voltage lines are carried on wood poles. The specification for paper-insulated cables up to 35 kV, which came into force in November, 1933, is probably the most complete of its kind issued in any country.

Considerable difference of opinion exists as to the most satisfactory types of protective gear. The tendency appears to be to use distance (impedance) protection on long h.v. lines

and the "Translay" system on local networks. Supervisory control and load-dispatching systems have been installed, but have not been used to the fullest advantage because of the excessive caution which fear of being responsible for an error of judgment produces among operating (and constructional) engineers in the U.S.S.R.

Railway Electrification

About 3,800 km. of railway lines is to be electrified before 1937. For suburban lines 1,500-V d.c. is being used with overhead contact lines and mercury-arc rectifiers in the sub-stations. In certain mountain sections in the Caucasus and the Urals, where electrification has been resorted to primarily to solve braking difficulties, 3,000-V d.c. has been adopted with overhead contact wires and motor-generators in the sub-stations.

The system to be used for long-distance main lines has not yet been decided upon. For this purpose a line running into Moscow is being equipped experimentally to enable several systems and types of locomotive to be tried out.

The electrification of the main Trans-Siberian line is also held in view, but this task presents many difficult transmission problems, particularly between the Ural Mountains and Novo-Sibirsk. On this section Soviet engineers would like to be in a position to transmit power over distances of more than 500 miles to traction sub-stations. Experimental institutions in Leningrad have been entrusted with the task of reporting on what form of transmission, if any, might be adopted in this particular case.

Research

Reference is made to the extreme importance which the Soviet authorities attach to research and extensive experimental work in the field. At the same time academic and fundamental research is having the closest attention, and very large electrical research laboratories have been developed in various parts of the Union; these activities are under the control of the Central Research Council of the Commissariat of Heavy Industries.

As an example of their size and scope the All-Union Electrotechnical Institute in Moscow may be cited. This is the central fundamental research institution to which the various works and factories of the All-Union Electrotechnical Trust (V.E.T.) send their more complicated problems and those investigations which they feel are beyond the scope of their individual, although quite extensive, research departments. The V.E.I. laboratories employ over 1,700 workers, some 800 of whom are men with university training. The departmental chiefs are, almost without exception, men who occupy professorial chairs in the universities.

For the most part the Leningrad laboratories confine their attention to problems dealing with the lighter side of electrical engineering and to extra-high-voltage work. Large central research centres are also being built in Harkov (Ukraine), Sverdlovsk (Urals), Tomsk (Central Siberia), and Tashkent (Central Asia). The organisation at Tashkent is making a special study of means of utilising solar heat in connection with the development of the arid desert areas of Turkestan and Kazakstan.

The plans of the G.O.E.L.R.O. authorities and (more latterly) Gosplan have been attended with considerable success, states the author, who has little doubt that in this particular industry more has been achieved than in many other branches of the country's economic life.

The position with regard to electrical manufacture forms a section of the paper which is reviewed separately below.

The Electrical Manufacturing Position

TURNING from the technical and constructional aspects of Russian electrical development, Mr. Monkhouse deals with the manufacturing side in a succinct manner, although the author admits that such a short survey hardly permits of justice being done to the great efforts which the Soviet authorities have made during recent years to organise their electrical manufacturing industries.

The whole of the country's electrical and power plant manufacturing facilities have been grouped into trusts under the Commissariat of Heavy Industries. The actual grouping of the various works has recently been under revision, but the total number of employés in the electrical manufacturing industry at the present time amounts to about 115,000 persons.

The author gives a list of thirty works, briefly describing the nature and achievements of each. They cover steam boilers, turbo-alternators, transformers, heavy and small motors, mercury arc rectifiers, marine equipment, welding plant, induction furnaces, heavy switchgear, meters, radio and X-ray apparatus, radio valves, telephone equipment, wires and cables, electrical porcelain, lamps and fittings, automobile electrical apparatus, locomotives and carbons.

New Factories and Adapted Old Ones

Several of the works formerly belonged to foreign manufacturers, among them being the Electrosila works, which was originally in the hands of Siemens-Schuckert. This has been greatly enlarged and produces turbo-alternators of up to 50,000-kW capacity, large rolling mill motors and, in a separate department, small motors, mercury-arc rectifiers, and marine equipment.

The Dynamo Works, Moscow, was formerly the property of the Russian Dynamo Co., an associate of the Westinghouse Companies of Great Britain and America. This, too, has been greatly extended and produces electric locomotives and traction equipment, crane equipment, battery trucks, &c. The Moscow cable works was established in 1911 to manufacture power and telephone cables under licence from the British Insulated Co.; this also has been extended and produces all kinds of cables and insulated wires.

The Harkov Electromechanical Works was built in 1915-17 by the Russian General Electric Co., an associate of the A.E.G. and the American General Electric. Extensions have been made and the works now produces large motor-generators, industrial motors, industrial switch- and control gear, meters, &c. A large new steam turbine and generator factory, designed to produce 2,000,000 kW of steam-power generating plant per annum, is being built alongside the works.

The Krazna Zoria Telephone Works (formerly the Ericsson Works) has been modernised and manufactures all kinds of telephone equipment, including complete automatic exchanges.

The Stalin Metal Works, an old-established concern, has been thoroughly brought up to date during the last ten years and now turns out steam boilers with capacities up to 225 tons per hour and steam turbines of up to 50,000-kW capacity, in addition to hydraulic turbines.

The Electro-Combinat (Electrozavod) is a large factory established during the early years of the first Five Year Plan, and is now divided into three sections. The A.T.E. Works produces electrical equipment for automobiles and tractors; the Transformer Works makes all sizes of transformers and recently completed the 20,000-kVA single-phase transformers for the 60,000-kVA main step-up groups for the Svir-Leningrad 220-kV transmission circuit; the Lamp Works produced forty-two million lamps in 1932: it makes thirty-five types of lamps and has special sections for neon-tube advertising signs, sodium lamps, &c. The Electro-Combinat also has a department for manufacturing electric arc furnaces; in 1933 a 3,500-kW, 12-ton furnace built by the works was put into satisfactory operation.

Among the factories under construction is an electric lamp works which will produce its own glass and filaments and have an output of 100 million lamps a year. The Ural Electrical Machine Building Combine has a works under construction which will make all kinds of electrical equipment and will be one of the largest works of its kind in Europe.

The works have prepared for themselves most ambitious production programmes, which in most cases they have not been able to fulfil owing primarily to inexperience and lack of co-ordination with suppliers of raw materials. On the whole, however, the strides which have been made have been surprisingly satisfactory. The Electrosila Works in Leningrad may be quoted as an instance of what is being done. This works has recently turned out seven 50,000-kW turbo-generators and has completed four of the 77,500-kVA low-speed generators for Dnieperstroi. The whole of the generating plant for the Svir hydro-electric station is being built in this factory. The Electro-Mechanical Works in Harkov has recently built a number of 10,000-kW motor-generator sets for the aluminium plant at Zaporoji.

Electric Locomotive Production

The new Electric Traction Works at Kashira is still under construction, but the Dynamo Works at Moscow has recently completed a number of 3,000-V, 2,725-h.p., 130-ton locomotives. The automobile equipment department at Electrozavod in Moscow is manufacturing per day 500 car sets of electrical equipment, including self-starters, magnetos, &c.

The steam-turbine manufacturing departments of the Leningrad Metal Works calculated to complete over 1,000,000 kW of steam turbines during 1932, but this figure was not reached owing primarily to difficulties with raw materials.

In a table the author shows the progress which has been made in electrical manufacture during the period from 1924 to 1932. The figures for turbo-generators are not given for the latter year, but in 1931 sixty-seven sets with a capacity of 518,000 kW were made. In 1932 8,283 transformers with a total capacity of 3,572,000 kVA were produced, 11,592 oil switches, and 325,254 kW of motors of over 100-kW capacity.

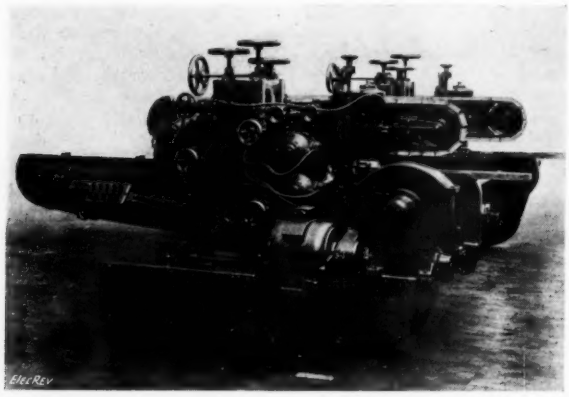
From the trade and production points of view the projected electrification of railways is of considerable interest.

Machine Tool Electrification. By W. L. Sims, A.M.I.E.E.

The need for reliability, simplicity, and standardisation

THE most comprehensive range of self-contained woodworking machinery and machine tools with integral-electric drives ever staged was probably seen at the recent Machine Tool and Engineering Exhibition. The electrical engineer was left to ponder whether the electrical industry could further the requirements of the user of the vast range of electrically driven machines displayed. It is necessary to modify some of the dogmas which in the past have governed the installation and manufacture of electric motors and control gear?

It is very different to legislate for installations with a few large motors and for those with some hundreds of small motors with their control gear. The double-end tenoning machine with twelve integral motors illustrated would, a few years ago, have been one of many driven from a main lineshaft which in turn would have been driven from one motor.



A double-end tenoning machine with twelve integral motors

In the ELECTRICAL REVIEW of April 6th, 1934, I emphasised the necessity for the wider acceptance of the squirrel-cage motor up to at least 25 h.p., and the desirability of permitting direct-on starting up to at least 5 h.p., as starting currents need not be limited to an amount "not exceeding 1½ times normal full-load current," or some similar small value. The more general the acceptance of squirrel-cage motors and direct-on starting the simpler becomes the control gear and the greater the reliability of the electrically driven machine tool.

Reliability must be the keynote of machine-tool design, since the machine tool is the basis of all engineering production, and as the machine tool itself is dependent on its power unit, the importance of simplicity of electric drive and control cannot be overstressed.

Seeing that the power unit is now multiplied many times in a modern factory, it may be questioned whether any portion of the electrical equipment can be still further simplified. It is general practice to demand three overload releases where the neutral is earthed and two otherwise. On a control panel carrying one or more direct-on contactors, at least one-third of the panel is taken up by overloads. Except for the space they occupy, thermal overloads are ideal for machine tool applications. They do not cause annoyance by operating unnecessarily on harmless momentary peak currents, yet closely protect the motor against conditions which would cause dangerous heating. They are, however, apt to destroy themselves whenever unusual conditions arise.

"Loose rotors and stators will ultimately be the most popular type of unit for machine tools"

Too Much Protection

The squirrel-cage induction motor made by the best British manufacturers is extremely reliable, and in the majority of cases where conditions of loading are known by the machine designer overload trips are practically a useless adornment to the starting gear. For this reason we may perhaps be over-zealous in our desire for overload protection. One well-designed overload trip per motor gives all that is required on a machine tool or woodworking machine, and should become the recognised and accepted practice. The sub-circuit fuses will take care of earths or short-circuits.

A need of the machine tool manufacturer is for standardisation of motor accommodating dimensions. Many plant engineers standardise on certain makes of motors; motor manufacturers themselves naturally prefer their own motors when they are in the market for machinery. Obviously, under present conditions, the manufacturer of integral-electrically driven apparatus has considerable difficulty in meeting the various tastes of buyers. Standard accommodating dimensions for both feet and flange mounting motors are wanted.

The Exhibition clearly indicated that the modern trend is towards straight lines, clean, unbroken surfaces and even stream-lining of machine tools. This type of design, due to its pleasing appearance and freedom from ledges to catch dirt and the ease with which it can be cleaned down, will become more and more evident. This mode can be satisfied only by absorbing the motor and control gear completely into the lines of the machine, which indicates that loose rotors and stators will ultimately be the most popular type of unit for machine tools.

Standard Specification Needed

Most of the manufacturers at present building these units have had the good sense to make their units interchangeable, but this should not be left to unorganised co-operation of the more intelligent manufacturers. In view of the importance of standard accommodating dimensions for both rotor and stator units and standard foot and flange mounted motors, a British Standard Specification is called for that will formulate sizes for loose rotor and stator units, and form a basis for bringing all accommodating dimensions into line within a reasonable time.

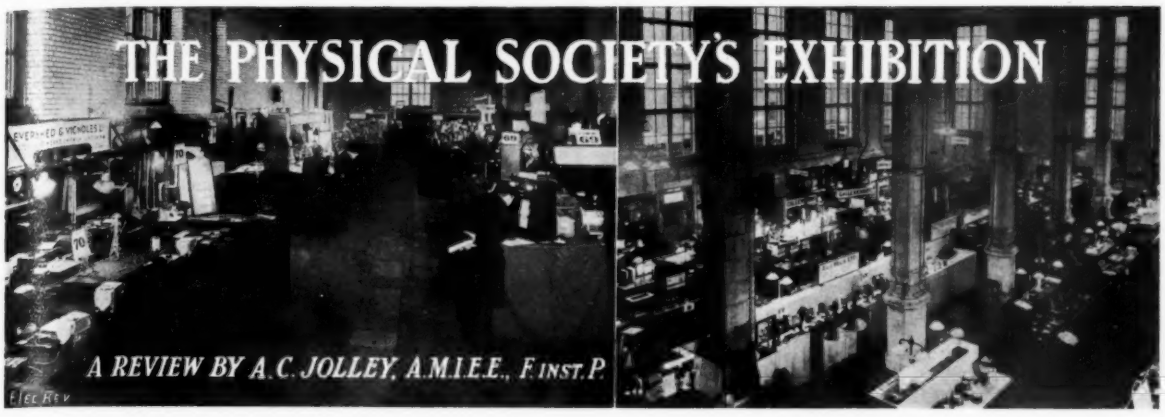
It should be borne in mind that many machine tool and woodworking machinery applications require motors only on a short rated-time basis, and a specification governing dimensions should therefore cater for both continuous and short time-rated motors.

Some of the machines exhibited were fitted with voltmeters and ammeters. This seems unnecessary as their indications would probably be meaningless to the average operator; in any case they do not convey any useful information regarding the working of the machine, assuming the motor to be suitably rated. If the electric drive has been successfully applied, the operator should not be always conscious that he is operating electrical apparatus, but should merely be aware that by pressing a certain button or moving a certain lever his machine starts, stops, brakes, inches, &c.

There is a considerable increase in the use of induction-type frequency-changer equipment, particularly in connection with wood-working machinery, in order to obtain speeds higher than those possible from 50-cycle circuits. This use of high-frequency will probably find greater application in the machine-tool industry generally. At present there seems to be little or no attempt to standardise on a basic voltage and frequency. Even where two or more frequencies above 50 cycles are available, the voltage does not usually increase in the same proportion as the frequency. This is unfortunate, because a squirrel-cage motor with stator core with low iron loss will operate from any frequency, provided the voltage goes up in the same proportion. Where these conditions are observed speeds are available according to the number of different frequencies, it merely being necessary to connect to the supply required by a selector switch.

I would suggest the desirability of recognising 220-V three-phase 75 cycles as a basic high-frequency supply, higher frequencies having a voltage increase in the same proportion. This would enable a minimum speed of 4,500 r.p.m. and a maximum speed of 10,000 r.p.m. (166 cycles) to be obtained with a two-pole induction motor without exceeding 500 V.

It would be necessary, however, to provide for a second high-frequency series. Manufacturers specialising in high-speed woodworking machinery use a base of 100 V, 300 cycles, three-phase for speeds of 18,000 r.p.m., increasing the voltage and frequency proportionally for higher speeds. With these speeds very small power units only are usually required.



THE PHYSICAL SOCIETY'S EXHIBITION

A REVIEW BY A. C. JOLLEY, A.M.I.E.E., F.INST.P.

A SPIRIT of keen alertness and animation is among the most striking characteristics which must impress the visitor who attends the annual exhibition of scientific instruments and apparatus which is held every January at South Kensington by the Physical Society.

This year's exhibition, which marked the quarter-century, was no exception in this respect, and it is of great interest to one who has attended practically all the twenty-five mentally to review the enormous changes which have been effected in the design and manufacture of instruments during this period. Probably in no other branch of industry are manufacturer and user so cordially and closely in association as in scientific measurement and in the design of instruments to carry out such measurement.

There was in this year's exhibition an interesting innovation, for both the Weston Electrical Instrument Co. and Messrs. Crompton Parkinson were exhibiting a few of the very early electrical instruments side by side with their modern counterparts. This, to my mind, is an excellent idea, for it brings home very forcibly to the younger members of the profession not only the strides which have been made in measurement but also the difficulties under which early experiments were conducted. One cannot fail to remark, however, that the early models shown on the Weston Instrument Co.'s stand differed very little in essential particulars from the present models, which is a great tribute to the excellence of the original design of Dr. Weston and his colleagues.

Progressive improvements are excellent and essential in all branches of the work, and the remarkable activity that this exhibition evidences is easily demonstrated by the large number of new exhibits which are shown each year, but some caution is necessary and the pace should not be forced too much if permanent injury to business is to be avoided.

Some instruments are very expensive items of equipment, and it is very discouraging to a purchaser to find that he has purchased a model which a year later has been superseded because the manufacturer has had time to study its shortcomings and remedy them. The changes are usually not in the fundamental principle, but in details with which the purchaser cannot become familiar until he brings the instrument into use. Taking, however, a general survey of the exhibits one cannot fail to realise that the products of British scientific instrument makers are among the finest produced in any country.

Valve Oscillators

A somewhat detailed résumé of the exhibits was given in the last issue of the ELECTRICAL REVIEW, and it showed clearly how wide a range of work the exhibition covers. The thermionic valve oscillator is now the principal source of supply for practically all measurements of capacity and self and mutual inductance as well as having extensive use for many other purposes. It is therefore not surprising to find that oscillator equipments, compact and of wide frequency range are being offered by most of the makers of precision testing apparatus.

Still more precise and elaborate equipments of the same nature have also been developed, as for instance, the latest model of the Ryall-Sullivan oscillator shown by Messrs. H. W. Sullivan, which has a range from 0 to 16,000 cycles per sec. The oscillator is built for mains or battery operation and by the use of Sullivan-Griffiths thermally compensated inductances, together with high-quality air and mica condensers in the circuits of radio frequency dynatron oscillators, a logarithmic frequency scale is obtained with a 0.2 per cent. accuracy. It is claimed that the hourly stability is 0.2 cycle per sec., while a daily stability of 1 cycle per sec. is obtained, and the frequency is not affected by valve change, power supply variation or load variation. The harmonic content is less than 0.3 per cent. for a power output of 500 milliwatts and output powers up to 4 and 5 volts can be obtained for ordinary purposes.

The use of intermediate frequencies derived from oscillators has greatly influenced methods of measurement and necessitated changes in the design of the rest of the apparatus employed. Screening has become an essential feature, and the metal case is replacing the more ornate polished mahogany and ebonite of a few years ago.

Precision resistances with small residuals are now generally offered by practically all high-precision instrument makers, and brush contacts of improved design were shown by Messrs. H. Tinsley & Co. and also by Messrs. Muirhead. The air dielectric condenser has steadily improved and this year Messrs. H. W. Sullivan have introduced temperature compensated condensers, both of the fixed and variable types, having quite remarkable accuracy.

Bridge-testing Apparatus

Complete bridge testing equipments or universal bridges are also becoming a very general item of equipment. Messrs. Claude Lyons showed a self-contained bridge intended for use at frequencies up to 5 megacycles. By employing a shielded bridge transformer this can be adapted for work at frequencies below 500 kilocycles.

Routine testing, particularly in connection with radio components and apparatus generally, has now assumed proportions which warrant the devising of special apparatus to carry out the necessary tests. Messrs. E. K. Cole showed some fine testing arrangements which included a mains-operated inductance bridge and a highly specialised bridge for capacity measurements on gang condensers. A portable impedance comparison bridge operating at 10 kilocycles is also mains operated and permits of comparisons being readily made with suitable standards of resistances, capacities, or inductances.

A bridge arrangement was also shown for measuring directly the harmonic content of audio-frequency tones between 150 and 3,000 cycles per sec. There were also apparatus for detecting pinhole faults in the enamel covering of wires by the aid of the surge produced in the grid circuit of a mercury vapour discharge tube when the fault comes into the circuit, and a convenient bridge for rapidly detecting short-circuited turns in coils of practically all types.

A very convenient form of Carey-Foster universal bridge for audio-frequencies was shown by the Cambridge Instrument Co., giving direct reading of capacity and self and mutual induction, as well as resistance, over a wide range. It can also be employed to measure frequency, but for this it is not direct reading. A sensitive pointer galvanometer is incorporated for d.c. work, and for a.c. working the supply is obtained from a 900-cycle screened microphone hummer, a telephone being then employed as detector.

The little "pot" galvanometer made by this company has previously been shown and is an excellent example of the value of moulding composition in instrument design, for the permanent magnet is moulded in with the carcase. This year a modified example of this instrument was shown as a fixed frequency vibration galvanometer. The tuning control is ± 5 cycles on the 50-cycle model and ± 15 cycles on the 100, 800, and 1,000-cycle models.

Cathode-ray Oscillographs

The permanently sealed cathode-ray oscillograph has now become an easily and conveniently operated tool for laboratory and industrial investigations, and the well-known equipment of Standard Telephones & Cables is now provided with a single traverse time base which is capable of adjustment from a linear speed of a few cm. per sec. up to a maximum of about 50 metres per sec.

Marconi's Wireless Telegraph Co. also showed a fine oscillo-

graph equipment with a power unit supplied from a.c. mains, the improved hard valve time base being arranged so that the time of traverse is adjustable within wide limits to cover a range from low frequencies up to radio frequencies. A synchronising device permits the wave form under examination to be synchronised with the time base and by merely pressing a key a single traverse can be obtained. The oscillograph tube is of the indirectly heated cathode type and is magnetically screened and an eight exposure roll-film camera is easily fitted by means of a bayonet catch to the oscillograph unit.

Miniature Indicators

In commercial indicating instruments the miniature instrument still holds the field, and this year Messrs. Elliott Bros. were showing round instruments of only 2-in. diameter and miniature edgewise patterns. The conventional adherence to the round pattern of switchboard indicating instrument is still very evident despite the fact that in these days of moulded cases there is less argument for it, and one feels that the rectangular case has a great deal in its favour from both the points of view of appearance and convenience.

On the whole the construction of indicating instruments has reached a high level in this country and most of the instruments shown gave evidence that the problem of obtaining good damping was much better understood than it was a few years ago.

The illuminated moving scale indicators introduced by the Cambridge Instrument Co. last year have been further improved so that an effective scale length of either 24 or 36 in. can be obtained, and a flux meter fitted with this device was shown.

Another ingenious system of scale illumination is employed by the Weston Instrument Co. in connection with small rectangular instruments, where two concealed miniature lamps within the instrument case are arranged to flood the ordinary enamelled scale with light. The recording or graphic instrument does not exhibit any very marked change, but Messrs. Everett Edgcumbe & Co. showed a graphic instrument in

This photograph of part of the huge ventilating system of the Mersey Tunnel was taken during a recent visit of the Tunnel Committee

which the torque has been increased and the inertia reduced to such values that fluctuations lasting only 0.2 sec. are faithfully recorded, without oil damping and all its attendant disadvantages.

Another interesting recorder of small size was shown by the same company. This employs a thin and very flexible disc chart of purple paper faced with a thin film of a waxy substance, and when the record is made the film is penetrated so that the dark under-surface below is exposed and resembles an ink dot.

Applications of the Photo-electric Cell

The photo-electric cell has been ingeniously employed in many ways since its comparatively recent introduction, and the self-generating light-sensitive forms have proved of great assistance in numerous industrial processes. Its application to photometric work was well represented in this year's exhibition. I believe that the Weston Co. was the first to introduce a self-contained direct-reading illumination meter. Since then instruments have been devised not only for the rapid comparison of light sources but also for the determination of photographic exposure, the measurement of opacity, colour-matching, and the determination of hæmoglobin in blood. All these applications were demonstrated in the exhibition this year.

The Weston Instrument Co. showed a model to illustrate the application of the cell as a smoke alarm. A beam of light is projected across the flue on to a photronic cell working in conjunction with a sensitive relay which, when obscuration reaches a predetermined limit, operates and closes the circuit of an alarm. An interesting feature of the relay is the method adopted to ensure rapid and sure closing of the alarm circuit. The relay tongue is tipped with a little piece of magnetic material, and a little cobalt steel magnet is mounted on the fixed stop; when the tongue passes a definite mark on the scale of the relay it comes under the influence of the magnet on the stop and is suddenly pulled over and held firmly in contact until reset by hand.

Both Messrs. Everett Edgcumbe and Salford Instruments exhibited box photometers for the comparison of electric lamps with direct-reading instruments mounted in the top, and these companies, as well as Messrs. Ferranti, exhibited cells and instruments combined in a convenient form for illumination measurement.

Metal Rectifiers

The metal rectifier has found uses in a very wide field. Heavy currents running up to thousands of amperes and high voltages such as would be employed in dust precipitation are now within the range for which the rectifier can be adapted, and heavy duty rectifiers, oil immersed in piped tanks like a power transformer, have been constructed. The application of the rectifier to measurement is now firmly established, and rectifier-operated instruments are now offered by all instrument makers. The Westinghouse Brake & Saxby Signal Co. has recently introduced a new type of rectifier for instrument use with greatly improved frequency characteristics, so that the performance of instruments employing them is much more satisfactory over a wider frequency range.

The Salford Electrical Instrument Co. showed moving-coil instruments with logarithmic characteristics obtained by shunting the moving coil with a suitable rectifier instrument. Another interesting adaptation of the rectifier was shown by the Cambridge Instrument Co. in the Spilsbury form-factor meter, where a voltmeter is first connected by means of a change-over switch to a vacuum junction and the pointer is brought to a definitely marked calibration point on the scale by means of an adjustable resistance; this calibration point also corresponds to the form factor of a pure sine wave. The switch then transfers the voltmeter movement to the rectifier, and the deflection which formerly was proportional to the r.m.s. value is now proportional to the mean volts, so that the instrument can be given a scale calibrated in the ratio of r.m.s. to mean volts or form factor, and can therefore be made direct reading. It is claimed that the form factor so given is accurate to 0.0002, and a very useful instrument, particularly for iron testing, is therefore available.

Multi-function Risks

The same company exhibited indicating iron-cored dynamometer instruments on the principle suggested by Dr. Drysdale a short time ago. These instruments embody sound fundamental principles, and therefore reach a very high electromagnetic efficiency, have a high torque, and are self screened against external magnetic interference. One of the instruments exhibited combined the functions of a precision ammeter, voltmeter, and wattmeter, a suitable selector and range switches being provided for the purpose as a part of the equipment.

There is, however, always an argument against doing too much with a single instrument. It is perfectly true that, with careful and thoughtful use, a single instrument can often be employed to cover a range where several single-range instruments would otherwise be required; but there is always the risk of an incorrect reading or a mistake in setting the range-switch or making the necessary change of connection, which may result in damage to the instrument itself or to other apparatus being used with it, and obviously this risk increases as the complication of the duties of the instrument is increased.

The Domestic Load-factor

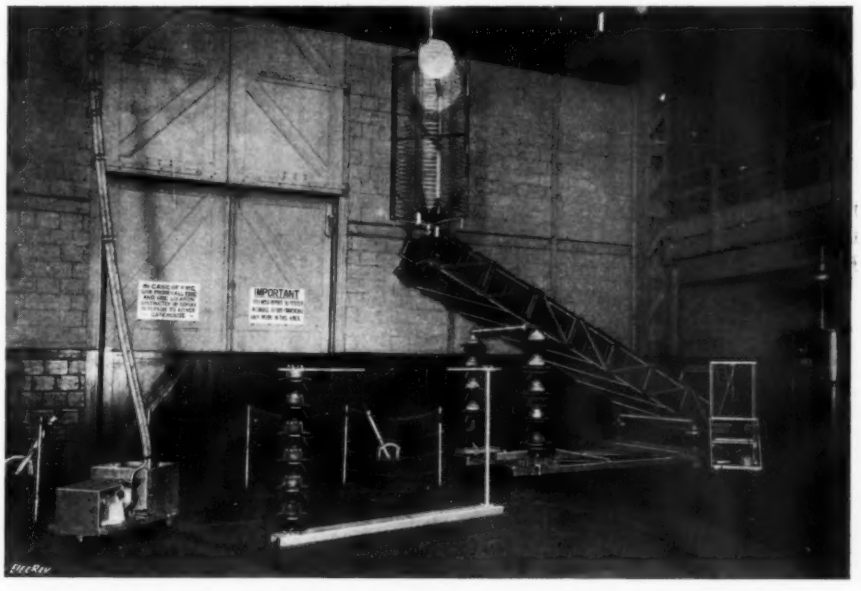
In our issue of October 26th (page 569) we referred to the fresh field opened up for the change-circuit system in new blocks of residential flats. A technical layout is given (with diagram showing sub-station equipment, distributing mains, house services and domestic wiring) in a recent pamphlet of the Change Circuit Development Co. Attention is drawn to the effect of improved lamp efficiency in the relation between the demands for lighting and for other purposes, and the economic results to be anticipated by the adoption of the system are compared with those obtained with ordinary methods.

A Large Impulse Generator

FOR testing by the application of high-voltage impulses of a character similar to those resulting from lightning discharges, the British Thomson-Houston Co., Ltd., has built and recently placed in commission at its Willesden works an impulse generator of large capacity.

Each of the twenty-eight condensers in the main bank is rated at 500 kV d.c. and is of 0.5 mF capacity. They are arranged in a circuit of fourteen steps, each of 100 kV with two condensers in series, the steps being charged in parallel and discharged in series. Thus the stored energy of the generator when fully charged is 17,500 joules, and the nominal voltage at full charge is 1.4 millions.

The resistance units of the stepped circuit are of 26,000 ohms each and they are connected on each side of the capacitor. The discharge takes place through sphere gaps, the spheres being 5 cm. in diameter. The condensers, resistances and discharge gaps are mounted in an insulated wooden frame which, in turn, is carried on a truck for convenient application in the test room. In use the high-voltage end of the frame is supported on porcelain pillars in a raised position sufficiently high for convenience in testing. The discharge is initiated by means of a motor-driven precision sphere gap, these spheres being 2 in. in diameter. The motor mechanism and reduction gear has a simple device which prevents overrunning and it is linked up with the first two sphere discharge gaps which close in along with the initiating gap, in this way assisting the discharge operation.



The 1.4 million volt impulse generator at Willesden. The adjustable water resistance is seen on the left, and on the right are the banks of condensers and the mobile 220-kV charging rectifier

The charging equipment comprises a half-wave hot-cathode glass rectifying valve capable of withstanding a maximum inverse peak of 220 kV. The filament is heated by an 18-V storage battery carried on the valve-mounting frame and fully insulated. The heating circuit is provided with a ballast resistance and a remote control switch so that current can be applied when required and cut off at other times. Charging resistances are provided to avoid overloading the valve and these, together with smoothing condensers to assist charging, are carried on the insulated mounting frame, thus providing a self-contained charging unit. As this unit is carried on ball swivelling castors it can be easily swung round and connected so as to charge the generator either positively or negatively, as desired.

The discharge circuit as commonly used is a plain inductance resistance circuit. The constants of the circuit may be selected to give wave forms of the character generally accepted as applicable to impulse testing. Particular care has been exercised to secure the smoothest possible wave and avoid oscillatory conditions. The reactor controlling the wave front is given a turn spacing, which permits its use at the full available voltage. The resistance for determining the wave tail comprises a water tube arrangement wherein the water is in continual circulation under pump action through a tank at the earth end. It is thus possible to adjust the resistance accurately and maintain it at any required value indefinitely.

Impulse crest value measurement is carried out with the aid of a one metre sphere gap. The setting of the gap is remotely controlled by means of a motor mechanism and suitable control switches. The value of the gap setting is continuously shown on a screen on which is projected an indicating mark and an enlarged view of the calibrated scale.

An Electrical Recorder for Rolling Mills

THE apparatus shown herewith has been developed by the Losenhausenwerk A.G., Düsseldorf-Grafenberg, for the electrical indication and recording of the mechanical pressure on the rolls of a rolling mill. The principle of the apparatus may be likened to that of a contact-making mercury thermometer. In this instance, however, the movement of the mercury column is determined by the mechanical pressure on the "bulb," which consists of a steel plate 1, fig. 1, with a cavity communicating with the central bore of a stack of contact plates, 5. The plate 1, surmounted by steel pads, 2, 3, is placed between the bearing cap of the upper roll and the bottom of the screw-down spindle, the ball-plate 4 ensuring an even distribution of pressure between the screw-down spindle and the plate 3. A mercury filling screw 9 is provided, and the adjusting screw and plunger 7, 8 enable the mercury level to be brought to the bottom contact plate in 5 before pressure is applied to the rolls, thus correcting for the effect of temperature on the position of the mercury.

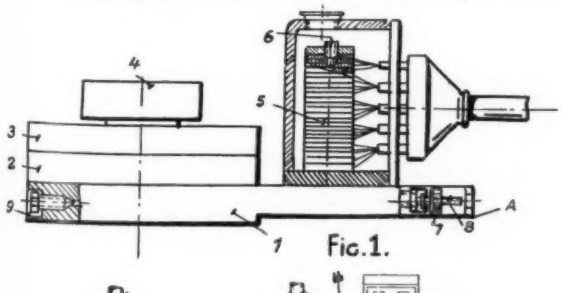


FIG. 1.

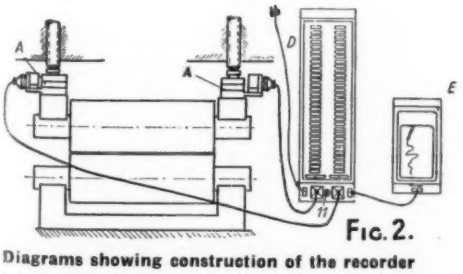


FIG. 2.

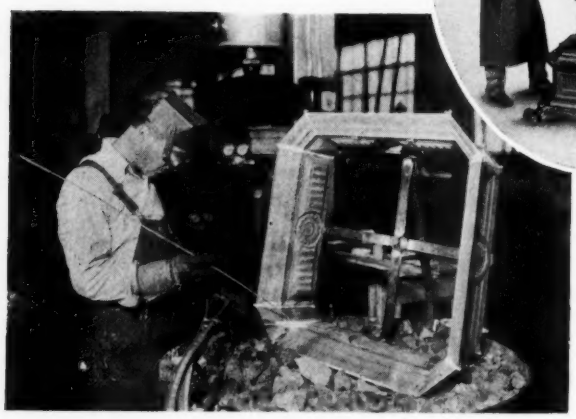
Diagrams showing construction of the recorder

The volume of the cavity in 1 is large compared with that of the mercury column, hence the slight elastic compression of 1 between zero and maximum load is sufficient to drive the mercury from the bottom to the top of the stack 5, the sealing screw 6 being released to allow the mercury free movement after the apparatus is installed. The contact plates in 5 are electrically insulated from each other and connected to lamps in an indicator box *D*, fig. 2, the windows of which are marked with the corresponding tons pressure on the rolls. In the arrangement shown, separate gauges and indicators are used for each end of the rolls. Between the bottom (zero) and top (red, maximum load) lamps there are thirty lamps each with a calibrated indicating window. Each lamp takes 0.1 A and the total consumption, rising to a maximum of 3.2 A, is a measure of the pressure on the rolls at each moment and, as such, may be recorded by a suitably calibrated recording ammeter, *E*. Supply to the lamp and meter circuits is at 4 V from an accumulator or a transformer, and the requisite connections are completed by plugs and sockets.

The foregoing information and illustrations appeared in a recent issue of the *E.T.Z.*

Brazing Bronze Lamp Posts. By A. J. T. Eyles

BRAZING with the aid of modern alloys containing silver is extensively employed in the electrical and general engineering industries for joining metal parts when greater strength is required than can be obtained by ordinary soft soldering, or when the parts have to withstand a temperature that would cause soft solder (tin-lead-antimony alloy) to melt. The technique of brazing is also used in cases in which the high temperature developed by electric arc or oxy-acetylene welding would seriously distort parts adjacent to those that are being joined. Products and components fabricated from bronze, brass, or copper can be joined so effectively by brazing with the modern brazing alloy "Sil-Fos" that the joint will be approximately as strong as the material itself. Unlike base metal brazing alloys (which require from 1,600 to 2,000 deg. F. to melt), "Sil-Fos" melts at approximately 1,300 deg. F., which is even lower than silver solder containing 50 per cent. silver, which requires from 1,400 to 1,600 deg. F. Because of its low melting point, its quick flowing and also deep penetrating qualities, this alloy is easy to use and permits of quick working.



Brazing a mitred joint in a bronze casting with "Sil-Fos" (below), and one of twelve bronze lamp standards for the Post Office at Fort Worth, Texas

One of the accompanying illustrations shows the brazing of mitred joints in ¼-in. thick cast bronze for the base of electric lamp-posts. These posts are about 10 ft. high and weigh approximately 750 lb. Eight small segments are brazed together to form a "ring." Some of these rings are round, some hexagonal, and some ornately irregular. Brazing with spelter was tried, in the first place, for joining the bronze castings together, but the rapid heat conductivity of the casting defeated every effort to join the parts properly. "Sil-Fos" was then tried, and because of the special qualitities which it possesses strong neat joints were made. A completed standard, illustrated above, shows the difficult nature of the task which confronted the engineers.

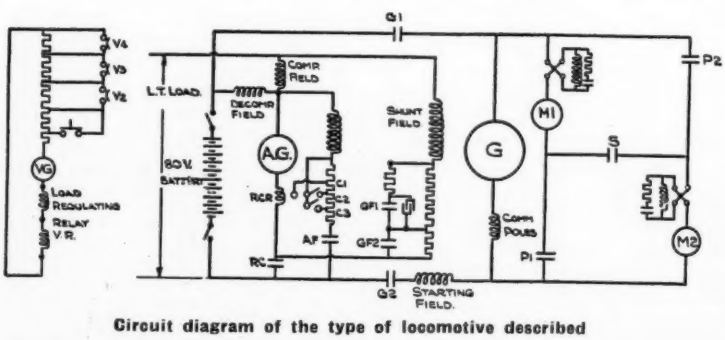
Twelve of these bronze ornamental lamp-posts have recently been fixed outside the Fort Worth Post Office, Texas, U.S.A. Johnson, Matthey & Co., Ltd., 78, Hatton Garden, London, E.C.1, are the agents in this country for the new "Sil-Fos" brazing alloy.

Diesel-electric Shunting Locomotives

LAST week we commented on the order placed by the L.M.S. Railway Co. for twenty 0-6-0 (six-wheel-coupled) Diesel-electric shunting locomotives, and we are now able to give constructional details of the ten to be supplied by the English Electric Co., Ltd., with mechanical parts made by Messrs. Hawthorn Leslie & Co., Ltd.

The track gauge is 4 ft. 8½ in.; wheel diameter 4 ft. 0½ in.; wheelbase 11 ft. 6 in.; and the minimum curve negotiated 290 ft. radius. The total weight under running conditions is 47 tons, which allows for carrying 120 gal. of fuel, 50 gal. of lubricating oil and 50 gal. of water.

On level tangent track with a resistance to motion of 10 lb. per ton the locomotive will start from rest and haul 800 tons at 10 m.p.h., assuming that 30 per cent. adhesion is obtainable by using sand. The maximum tractive effort is 30,000 lb. On a gradient of one in a hundred the maximum trailing load is 480 tons at 5.5 m.p.h. The one-hour rated output is 10,200 lb. effort at 9 m.p.h., and the continuous output 7,500 lb. at 13 m.p.h., both with a generator input of 319 h.p.



Circuit diagram of the type of locomotive described

The engine is of the cold-starting four-stroke type with six vertical cylinders (12-in. dia. by 10-in. stroke), driving at 615 r.p.m. a 220-kW 440-640-V generator and 11-kW, overhung, differentially compounded exciter, which also charges a 40-cell 224-Ah starting battery and supplies current for lighting, control and auxiliaries. The normal rating of the engine is 300 b.h.p. with 10 per cent. overload for one hour at a maximum altitude of 500 ft., and a maximum ambient temperature of 100 deg. F. The rating is reducible by 4 per cent. per 1,000 ft. and 1 per cent. per 5 deg. F. above the basic figures.

The guaranteed consumption in lb. per b.h.p.-hr. of fuel oil having a net calorific value of 18,250 B.th.U. per lb. is: normal load, 0.39; three-quarter load, 0.41; and half-load, 0.44. Lubricating oil for making up losses is about 0.65 pints per engine-hour.

Three-point suspension of the generating set is employed. The engine is electrically controlled from the master controller from two positions in one cab, lubricating oil under pressure being admitted by solenoid-operated valves into cylinders, the pistons of which vary the governor spring settings and timing. Failure of the oil pressure automatically causes the engine to shut down.

Control Features

Seven control stops can be selected; for the first five the traction motors are in series with full field with speeds ranging from 350 r.p.m. (idling) up to 675 r.p.m., when the output is 350 h.p. The other two stops give parallel motor connections with full field and weakened field. If the master controller is stepped back from the sixth or seventh notch the parallel connection is maintained until the last stop, thus making it available for intermediate speeds.

The torque control mechanism includes a permanent-magnet generator directly driven from the engine, to the speed of which the voltage is proportionate. Across the terminals of this generator, and in series with an adjustable resistance, is a relay fitted with a pair of contacts which open and close as the current in the operating coil alters, and so open and close a contactor in the generator field, with the magnet coil of which they are in circuit. Each of the two traction motors fitted to the underframe drives one axle through single-reduction spur gearing. The one-hour rating is 173 h.p. with 100 per cent. overload for one minute, and the continuous rating is 118 h.p.

The rotary exhauster for the vacuum brake is driven by a 3.5-h.p. motor and the compressor for the air-brake is also electrically driven from the exciter. The 4.2-h.p. motor driving the cooling fan is supplied by the main generator, and is thermostatically controlled. A demonstration locomotive of the same type has covered a distance of 6,000 shunting miles since last April, and the Diesel has run 3,000 hours; after a brief examination recently the unit was immediately put back into service.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Cathode-ray Oscillographs

TWO papers were presented at the Meter and Instrument Section meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 4th. In one of them Prof. J. T. MacGregor-Morris and Mr. J. H. Henley deal with the theoretical and practical sensitivities of gas-focused cathode-ray oscillographs, and the effects of the gas on their performance. Recent modifications in construction and some of the resulting improvements are described, while a comparison is made of the electrostatic sensitivities obtained from simple electron dynamics and that found by experiment for two focusing gases, argon and helium; an explanation is advanced for the results obtained.

The phenomenon of origin distortion is considered, and results are given showing its variation with gas pressure for hydrogen, and with the frequency of the deflecting voltage between 0 and 1.25×10^6 cycles per sec. for hydrogen, helium, and argon, as focusing gases. The dependence of gas focusing on the transverse speed of the electron beam is discussed, and the paper concludes by indicating the practical importance of the results given.

The actual electrostatic sensitivity of a gas-focused cathode-ray oscillograph is about 30 per cent. higher than that calculated from simple theory, the difference being possibly due to the effect on the beam of a negative charge on the insulated fluorescent screen. It is evidently desirable to modify the design by lining the inside of the glass envelope, including the fluorescent screen, with some form of conductor and anchoring its potential. The principal advantages resulting from this would be: an increased brightness of the fluorescent figure; ability to operate the tube at a lower anode voltage when a higher sensitivity is required; certainly as to the actual sensitivity of the tube; complete isolation of the tube from external electrostatic fields.

Origin distortion necessarily accompanies the use of gas focusing when deflection is effected by means of simple condenser plates. For a given degree of focusing the origin distortion at low frequencies is independent of the nature of the gas used, since the focusing and the distortion depend upon the same properties of the gas. A considerable increase in origin distortion occurs at deflecting frequencies above 50 k.c. per sec., and this increase depends upon the atomic weight of the focusing gas. The advantage of using a light focusing gas to obtain smaller variation of sensitivity with frequency is clearly shown.

The three gases tested are placed in order of ionisation efficiency with regard to quality of focus at high deflecting frequency, argon being better than hydrogen or helium. It is evidently possible to compensate largely for the loss of focus by suitable increase of the beam current, although when this has been done the ends of the trace are still irregular.

This research has been rendered possible largely owing to the fact that Messrs. A. C. Cossor, Ltd., extended many facilities to the authors, while Mr. L. H. Bedford prepared the special tubes required.

A Recent Development

In the second paper Prof. S. Parker Smith, Dr. C. E. Szeghö, and Mr. E. Bradshaw describe equipment embodying a high-voltage, gas-filled, sealed-glass, cold-cathode-ray tube, which is of recent development and requires no pumps.

The outfit is accommodated on a wheeled trolley and it is intended for high recording speeds (transient phenomena), though it can also be used successfully for many of the normal applications of the strip and the low-voltage cathode-ray oscillographs.

The original difficulty in connection with the cold-cathode sealed tube was crater-formation in the cathode, which soon rendered it necessary to change the cathode. Although simple with the metal tube, this was impossible with a sealed-glass tube having a normal cathode. This difficulty has been overcome by using a movable cathode consisting of a loose metal ball, the position of which can easily be moved by lightly tapping the tube, thus presenting a new face towards the anode. This sphere is made of aluminium and the glass tube serves merely as a vacuum chamber. The anode, deflection plates, &c., are all attached to a 65-mm. diameter aluminium tube, which serves both as a screen and as a structural element for ensuring correct alignment of the diaphragms and plates.

For trapping the beam two trap chambers are formed in the cylindrical casing by three transverse circular plates, each having an aperture at the centre. The beam passes through the first and narrowest aperture to the first trap chamber. The deflection plates are just past the anode aperture. The end of this chamber is formed by the second diaphragm and aperture. The deflection plates in the second chamber, which terminates with the third aperture, are connected in parallel with those in the first chamber. The first two apertures are 140 mm. apart, and the second two are 290 mm. apart.

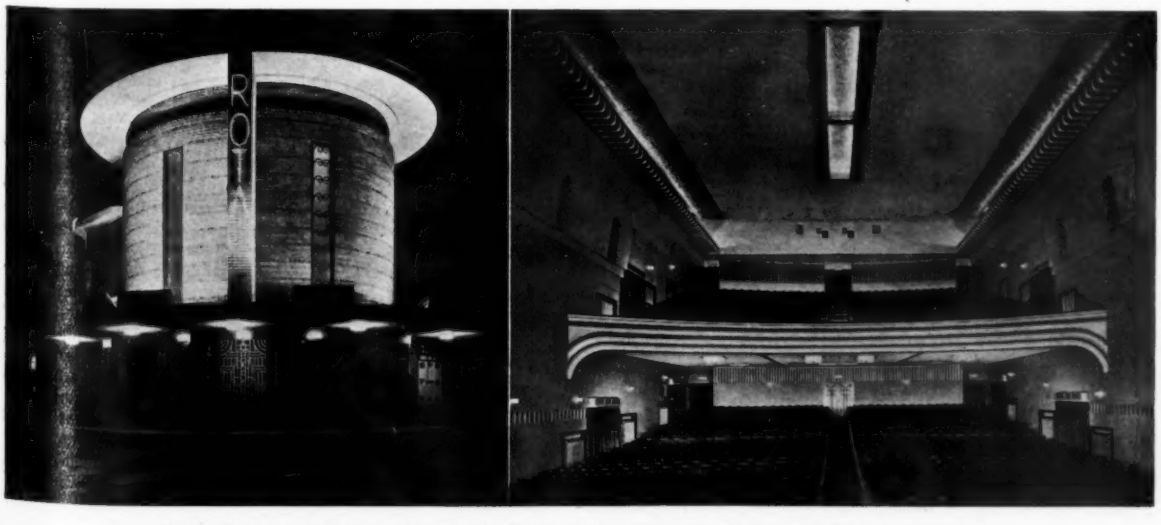
After the third aperture, *i.e.*, outside the trap chambers, come the time-base deflection plates and, perpendicular thereto, two pairs of plates for connection to the external circuits which are under investigation.

The work represented by this paper was done at the Royal Technical College, Glasgow.

The History of Stage Lighting

STAGE lighting from the earliest times was described by Mr. L. G. Applebee in his paper, "A Cavalcade of Stage Lighting," read before the ILLUMINATING ENGINEERING SOCIETY in London on January 8th.

Dealing with the present-day stage spotlight, the author suggested that the projector lamp would be used more if the lamp manufacturers could produce a lamp with a point source of light. Some of the filament pin focus work with these lamps was practically impossible without the use of optical attachments which reduced the light so much as to render them useless, owing to filament images. He therefore looked forward to the day when the lamp manufacturers would provide a filament which would be like the cylinder of lime and be virtually a ball of white fire.



Effective exterior and interior illumination at the new Rota Cinema, Denton, Manchester

In 1921 a special form of incandescent spotlight was invented to overcome the filament image. This represented a distinct step forward, and in many small theatres had replaced the arc spotlight used from the back of the gallery. Both at Covent Garden and at the Shakespeare Memorial Theatre banks of these lanterns using 30-V 30-A projector lamps were concealed in the main ceiling to illuminate the fore stage and the acting area. Twelve of these lanterns with an average throw of 120 ft. were used at the Albert Hall Pageant of Parliament.

The year 1934 saw the reorganisation of the stage lighting at the Royal Opera House, Covent Garden. The new equipment was entirely of British manufacture. Special 11,000-V cables were brought to the theatre sub-station and the energy was transformed down to 230 V a.c. three-phase. The stage connected load was 700 kW for incandescent light, and 150 kW at 100 V d.c. from an independent supply. The cyclorama was floodlighted by 148 1,000-W lanterns for general illumination. Horizon lighting at the bottom was by means of mobile trucks having seventy-two 500-W flood lanterns. Orthodox lighting for the ordinary type of scenery was by means of five battens with 150-W lamps in each compartment. A lighting bridge over the proscenium was equipped with twenty-four lanterns of different types, some arc lanterns for producing optical effect, such as clouds, &c., and others of the 1,000- and 2,000-W projector type.

On each side of the proscenium opening were special three-tier portals equipped with 1,000-W spotting lanterns. An additional three spots using 30-V 30-A type projector lamps were concealed in the auditorium dome with provision for electro-magnetic colour changing from the stage switchboard. Altogether there were available seventy-six plugs in the stage floor to which movable apparatus could be connected, while in the flies were eight incandescent plugs and eight arc-lamp positions for spots, &c.

Electricity and Bottle-making

SEVERAL problems of the glass bottle industry are referred to in a paper by Mr. W. A. Moorshead which was read at a joint meeting of the INSTITUTION OF CHEMICAL ENGINEERS and the SOCIETY OF GLASS TECHNOLOGY in London on January 9th.

The overall efficiency of typical melting furnaces is about 18 per cent. on normal load and 27 per cent. on maximum load, so that there would appear to be plenty of room for improvement. The idea of using electricity for glass melting was proposed about half a century ago, and since then many different suggestions have been put forward. The best appears to be the method whereby the electrical conductivity of the molten glass itself is used.

On this principle a small working model made to scale was recently tried at the works of Messrs. Pilkington Bros., St. Helens. The furnace delivered 5½ tons of glass per day. It was rectangular and had five pairs of submerged electrodes of the purest Swedish iron obtainable along the sides. From a glass technologist's point of view the only difficulty was the erosion of the electrodes, which increased the iron content of the glass just enough to make its decolorising a serious problem. The overall fuel efficiency of this furnace was about 78 per cent. The author considers, however, that the price of energy must be reduced considerably before electric melting can be seriously considered by the glass manufacturer.

Before melting, the mixed raw materials are sometimes passed over magnetic pulleys to extract metallic impurities. The most troublesome of these is iron oxide, 0.08 per cent. of which will turn glass green in spite of decolorising agents.

The chief problem connected with all feeder- or flow-type bottle-forming machines is that of the varying weight of the "gob," *i.e.*, the charge of molten glass entering the mould. Automatic means have been adopted in some cases to cause each article to stop momentarily on a small balance that is electrically connected to an indicator which lights red or green lamps according to whether the article is too light or too heavy.

Finished bottles are annealed by passing through lehrs on conveyors. In the latest type the whole of the conveyor is inside, so that the return half remains hot. For average loads the hot bottles themselves provide all the heat necessary, while large loads have necessitated artificial cooling. An experimental universal lehr has been designed with a 15-kW electrical heating installation for use with very small loads which has enabled ware to be annealed and cooled down to atmospheric temperature in from one to two hours instead of the four to five hours needed with the old types.

Develop the Power Load. By R. A. Lochner, A.M.I.E.E.

IT is the earnest desire of the electrical industry to see the output and consumption of electricity in this country increase as rapidly as possible. The continued success of the Central Electricity Board and its ancillary undertakings is dependent to a large extent on this further expansion. During the last five years most gratifying progress has been made in this direction and recently the prominence given to domestic supply by the Electrical Development Association has produced a welcome increase in the interest displayed by the general public and in the number of electric heating and cooking consumers.

While all such efforts are welcome as representing a greater propaganda drive, there is a danger that continued publicity on the domestic side may give this branch of distribution greater prominence than its relative importance deserves. The "bread-and-butter" business of the larger supply undertakings, particularly in the Midlands and North of England, is still the industrial power load. The addition of even one small workshop or mill is worth a whole street of domestic consumers. Moreover, the load factor of the industrial consumer is still higher than that of the most completely electrified house and his demand is not so seasonable in character.

Anyone touring various factories and mills in the Northern districts must be impressed by the very large number of these which still continue either to generate their own electric power or even to run their mill machinery direct from steam engines or some other form of prime-mover. A number of such private power plants has been installed comparatively recently, particularly in water and drainage pumping stations. Certain of the mills have, it is true, a very good reason for the installation and maintenance of their own steam plants, inasmuch as they require large quantities of process steam. In the majority, however, this demand for process steam is insufficient to justify a private plant, always providing that a reasonably cheap and reliable public supply is available.

In many areas this proviso is already met, but the new Electricity Supply Bill (1934) will have the effect of still further extending the territory of competitive public supply. By this measure more competitive facilities are to be rendered available, and it is hoped that the output of electric power for industrial purposes will be increased considerably. The presence of facilities, however, is not sufficient to bring about this desired increase of load and to induce those works which are at present generating their own power to transfer to public supply.

In my opinion some further sales machinery is necessary if the full benefit of these facilities is to be felt by consumers and the electrical industry alike. I suggest that the time of the new Bill becoming law should coincide with the formation of an industrial electric power association whose purpose would be the handling of national propaganda and general sales of industrial power. It could be operated as a section of the existing Electrical Development Association, or it might function as a separated body under the ægis of the Central Electricity Board.

The detailed purpose of such an association would be primarily to boost the sale of electrical power amongst works and mills at present owning private generating plants, amongst those driven direct from prime-movers, and amongst all new works being built from time to time. To undertake this work successfully close co-operation would have to be secured with the local supply authority, the manufacturers, and with the actual user. The engineering staff of such an association would require to be in a position to survey and draw up schemes for the electrification of complete mills and works and to assist the consumer and the local supply undertaking in the negotiations for a suitable tariff; and they could co-ordinate the proposals of the various manufacturers and render unbiased and valuable technical advice.

The type of service that I have outlined is obviously outside the scope of either the local supply undertaking, or the electrical manufacturer or the usual consultant. I do not regard it as the duty of any of these to undertake the very necessary propaganda which now seems to be almost non-existent on the industrial power side. Such an association would enable the activities of similar associations in competitive industries to be met and would provide for the sales case for electrical power to be handled in an organised and commercial manner. The activities of the association need not conflict in any way with the normal contact with consumers made by local power companies. The facilities offered would supplement those of the local undertaking while its technical service would be available to suppliers and consumers alike. The cost of such an association, since its function is one of sales, should fall upon the supply industry, possibly equitably divided between the Central Board and the local power company.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Old, but Useful

From the correspondence columns of your issue of January 4th it is interesting to learn that the Manchester Corporation Electricity Supply Department had until quite recently some of its old bare copper-strip conductors in use. It may perhaps also be of interest to note that the Kensington and Knightsbridge Electric Lighting Co., the first undertaking to employ this system, has some five or six miles of the Crompton seven-, five- and three-way bare copper-strip distributors strained upon insulators in culverts still in satisfactory operation in various parts of its district.

Most of these culverts were part of a network laid over forty years ago and although in consequence of the change-over from d.c. to a.c. now in progress they will naturally disappear, the fact that it has been found expedient to retain them, both from the commercial and engineering points of view, reflects considerable credit on the original designers.

Once the right type of insulator was found these old mains gave excellent service, being practically free from trouble with almost negligible maintenance and repair costs. In addition to which the ease with which the section can be increased as required and services connected has more than warranted its retention for so long a period. G. C. WESTON,

Chief Engineer, Kensington & Knightsbridge
London, S.W.7, *Jan. 7th.* Electric Lighting Co., Ltd.

The Six-hour Shift

Mr. L. J. Goldsworthy's advocacy of a six-hour shift is not likely to receive support from organised bodies who have fought for years to raise the standard of living higher than it was in pre-organisation days.

I take it that he was prompted to start on the shift worker as such a worker is one with fixed hours of duty. But it would not do to lower the standard of living of these men alone; the whole of the industry must come into line and the standard of living of all workers and technicians must be brought to a lower standard if the suggestion is adopted.

Dealing with the generation side of the industry alone, is there any need for men to sacrifice 12 per cent. to 20 per cent. of their wage? Will the cost of generation increase to an extent likely to affect the cost of electricity to the public if an extra shift is taken on and the extra cost placed to the generation costs? Published wage figures seem to show that generation can stand this extra burden. The suggestion that a fixed Government grant should be made seems to class a prosperous industry with those that are unable to support themselves. It seems quite obvious that a Government grant is not necessary and the extra cost must fall on the employés and/or the industry.

The only fair form of Government intervention is the passing of a law restricting the working week to thirty-six hours in the industries which it is considered can exist under these conditions. Without a law to this effect men would have to be paid the same wage for thirty-six hours as for forty-eight hours. Otherwise a small section would be penalised.

London, E.17, *January 7th.* V. HAMMOND.

The Boiling Plate Question

While I admire the efforts of Mr. Bickell and Mr. Howard to plead the cause of two particular types of boiling plates, I cannot reconcile the arguments put forward by the former gentleman as being in the interests of electric cooking. To state that "Any old pots and pans may be used, and the blacker the bottom the better the results" is a contradiction of the slogan "Electricity for cleanliness."

The average housewife is not so much concerned as to whether any particular plate will boil, say, 2 pints of water in seven minutes as against another which may take nine minutes; or whether one type will consume, say, 1,600 W and another 1,650 W, as with cleanliness and ease of maintenance. We have only to note the type of utensils used by cookery demonstrators all over the country to realise the fallacy of Mr. Bickell's statement.

The first paragraph in my letter published in your issue of December 21st, appears to have been misunderstood, and would probably have read better if it had been phrased as follows:—"After trying various makes of plates during the past fifteen years, including the open type more recently placed on the market, I discarded the latter principally on account of the time involved in cleaning."

For the information of Mr. Howard, I may state that I have tried the "Superspeed" plate referred to by him, and the results only confirm my opinion of the open-type plate at present available. Of course, as I have only had fifteen years' experience of electric cooking I quite appreciate the fact that my education in this respect may be incomplete; nevertheless, my remarks are merely representative of the typical housewives' views, and do not relate to any particular make.

Possibly if the same thought and care is in future put into the design of domestic appliances, as has hitherto been given to electrical machinery, better results may yet be achieved.

Manchester, *January 5th.* NINA DYSON RAYNER.

I quite agree with Mrs. Dyson Rayner that the solid hot-plate and correct utensils are very satisfactory in performance. I use heavy aluminium pans which are ground flat at the bottom and fit well down on to the plate. Could one ever conjure up enough energy to cook an appetising meal if confronted with a row of blackened pans on the kitchen shelf?

Chester, *January 7th.* ANN PENRHOS.

Load Levelling

There is one form of load levelling which does not seem to be used as much as it might be, and that is to give cooker and water-heating supplies from one meter. Many supply authorities will provide cooker services free—why could not they also supply a water heater and put these two items on a change-over switch? The additional wiring would generally be a small matter.

Such an arrangement if adopted would have a considerable levelling effect on the load, would reduce the maximum demand, and with a popular price would do much to further the use of electricity and bring more business. J. COXON.

Birmingham, *January 5th.*

A.C. Lift Controllers

I should like to make clear to Mr. Woodiwiss that my criticism of his article was on the reasons he gave for the change from a.c. to d.c. control. The author in his reply laid stress on the large number of operations and consequent wear of spindles and bearings on the contactors.

First, let me say that 3,000 operations per week does not strike me as a staggering figure since lift control gear and resistances are rated, to the best of my knowledge, on forty starts per hour. Secondly, I do not agree that magnet armature hum and rattle are caused by slack bearings if the armature is of the modern floating self-aligning type.

If the main objection to a.c.-operated contactors were wear on the bearings, then the solution would not be to operate the gear by an expensive rectified a.c. supply, but to fit bearings which would stand up to the duty. It should be borne in mind that the d.c.-operated contactor bearings must also stand up to a similar duty without undue wear, since loose bearings on d.c. contactors cause trouble when closing.

With regard to the excessive current taken by a.c.-operated contactor coils should the magnet fail fully to close, I did not see the necessity of going into detail, since all electrical men will appreciate that this is so. However, this criticism cannot be fairly levelled at the a.c. contactor. If correctly designed, the contactors will close up on a voltage 80 per cent. of normal, and therefore they should not fail to close under normal circumstances. I must repeat that if either a.c. or d.c. contactors do not fully close, then there is every chance of their contacts "freezing." Why should a minimum voltage relay not be fitted to cover the contingency of the contactors tending to operate below their "sealing" value?

The fact that several manufacturers have adopted d.c. control circuits is no conclusive proof that it has been done to benefit "consumers" from a trouble point of view. It can just as easily be suggested that the change has been made to cheapen the cost of manufacture of the contactors, since undoubtedly an a.c. magnet will always be dearer than a d.c. one. Then, of course, coils can be standardised on one voltage since the rectifier will become the variable quantity, and this is not usually manufactured by the control gear makers.

It would be interesting to have the opinion of some lift gear manufacturer on the reasons underlying the change from a.c. to d.c. control. G. O. MACMILLAN.

Bradford, *December 31st.*

The Sheffield Appointment

A notice has been published by the A.M.E.E. and E.P.A. requesting members to refrain from making an application for the above appointment.

Appointments of this nature are a definite temptation to the engineer who is badly remunerated. There are a considerable number of engineers in control of urban and rural district council areas who are carrying heavy responsibilities for which they are paid less than the chief clerk of a large undertaking. Unfortunately, the National Joint Board scale is only applicable to undertakings from 1,000 kVA. Engineers in control of undertakings below this size have no definite scale of salary, and depend absolutely on applications for increases, which are invariably ignored.

In the case of workmen employed by a borough or urban district council wages are rigidly controlled by the particular trade union of which they are members. It is an anomaly, but, nevertheless, a fact, that even Labour councils are deaf when an application for a reasonable scale of salary is received from their electrical engineers. This leads to an iniquitous system of wire-pulling, which a minority of engineers put into effect as a last resort.

It may amaze readers to know that many engineers in charge of fairly large areas are paid magnificent salaries ranging from £260 to £350, and are probably crying in the wilderness for these conditions to be remedied. The majority of these engineers are married, and, in consequence, must hold their positions. If they resigned, their appointments would be advertised immediately at probably a lower salary. What remedy can be applied I do not know, but I am certainly of the opinion that consideration should be given to a scale of salaries for badly remunerated engineers who, in a considerable number of cases, hold the highest qualifications in their profession. RELUCTANT OPTIMIST.

January 8th.

The Torque of an Electrical Machine

In his article in your issue of December 28th Dr. Hughes has attempted to clarify an old problem, which crops up, I suppose, with a periodicity of about ten years. There was an article on the subject in your issue of May 11th, 1923, page 755, but the whole matter was most thoroughly investigated by Dr. D. K. Morris in connection with his papers on eddy current brakes. In the *Journal* of the I.E.E., 1905, page 457, the forces due to an inclined tube of magnetic flux are clearly set forth.

The picture which Dr. Hughes now draws of the effect of a compensating winding is illuminating, but he also suggests that his treatment will show why the tangential force on the modern armature is sustained by the iron and not by the conductors. He will forgive me for saying that I think he fails to do this, while in some other respects his method seems open to objection.

The fact is that the passage of a tube of induction through any surface of any metal at any angle is not of itself sufficient to produce unbalanced forces tangential to the surface. It is only when such a tube suffers a change of direction in passing through the surface that forces appear, with consequent motion or tendency thereto.

Change of direction may be brought about by asymmetrical permeability, as in some toy motors, or by deflecting currents, as in larger machines. If deflecting currents in armatures entail no variation in permeability, there is no pull upon the iron core. In the old smooth-core armatures there is no reason to suppose that (apart from hysteresis and eddies) the armature core experienced any torque except through the driving pegs. No torque is involved in rotating an iron cylinder in a uniform radial unidirectional field. It is the fact that the slots are veritably slots which makes all the difference in modern motors. Dr. Hughes does not seem to appreciate this point.

I do not think that the analysis in connection with figure 6 is accurately stated. The m.m.f. at c due to the currents shown between a and b is not zero, but its radial component is. This is seen from the fact that the condition between a and b is almost that of a uniform current sheet, carrying, say, i amps. per cm. of width. If such a sheet lie in air, the field strength near to it at a point such as c is $0.2\pi i$. If it lie on an iron core of high permeability, the field strength at c on the side of the strip opposite from the core is (as Dr. Hughes agrees) nearly $0.4\pi i$. Moreover, Dr. Hughes charges text-book writers with stating that the cross-flux is radial. Can he quote a single instance of a reputable writer making this statement?

These comments are not intended to be captious. Dr. Hughes has always been as anxious to arrive at the truth as any teacher in the profession, and for this reason he will accept them in the spirit in which they are tendered.

Birmingham, *January 7th.* WILLIAM CRAMP.

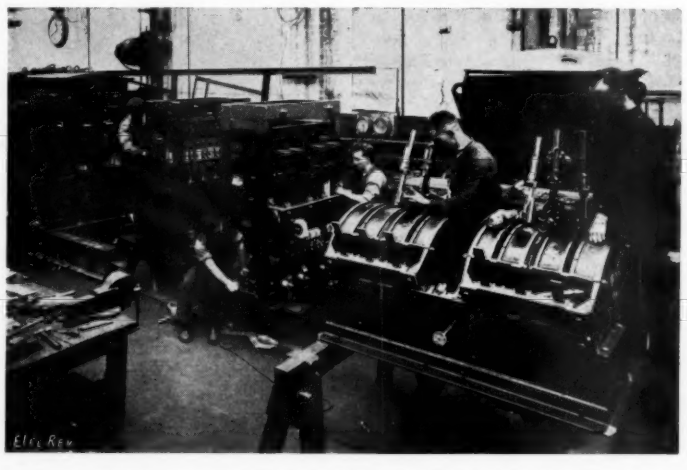
[Professor Cramp has drawn our attention to a misprint in the last line of the first column of Dr. Hughes's article, where πl is given instead of πD.—EDS. ELEC. REV.]

British Control Gear for a German Electric Ship

IT is of interest to record that control gear for the turbo-electric propulsion equipment of the recently launched North German Lloyd liner *Scharnhorst* is being made at Rugby by the British Thomson-Houston Co., Ltd.

In general the equipment is very similar to that supplied for the P. & O. liners *Strathaird* and *Strathnaver*. The system patented by the B.T.H. Co. derives full benefit from solenoid-operated contactor switches in ordinary service; and the Board of Trade requirements for mechanical operation are complied with in such a way that the same levers and method of manipulation are used in both methods for closing and opening the contactors. This arrangement is, in effect, an electric servo-motor system with solenoids normally used to rapidly open and close the large-capacity contactors on the initial movement of a control lever.

This quick-action feature definitely prevents the operator keeping a contactor too long in a partially open position, in which the arcing can be very destructive to the contact surfaces. The follow-up mechanism comprises a robust camshaft rotating on ball bearings, the cams being specially arranged to give both opening and closing actions. The camshafts are mechanically connected to the control levers that are also mechanically connected to the master controllers, which are electrically connected in the contactor solenoid circuits.



Three of the four contactor groups and hand lever gear in course of manufacture

The initial movement of a lever actuates the master controller over the corresponding solenoid contacts. This causes the large contactor to close by magnetic means, and further travel of the large hand lever on to the required point indicated by the dropping of a latch into the lever quadrant causes the mechanical cam mechanism to "follow up." At the same time, the master drum rotates into a position which interrupts the supply of energising current to the contactor solenoids. If the contactor fails to close magnetically the operator will know instantly, as he will require to exert a much greater effort to move the lever; but no time need be lost as the greater effort will result in the contactor being closed by means of the camshaft. The sequence interlocks between the different contactor groups are entirely mechanical.

These turbo-equipments utilise three-phase motors, and a reversal of the direction of rotation of the propeller motor necessitates certain line contactors being opened before other line contactors are closed, otherwise a short-circuit would occur. Such propeller reversal is the only means of bringing about an emergency, or even a normal, stoppage of a ship in a reasonable time. The "dead man's handle" idea is quite useless for ship propulsion, and experience has shown that positive mechanical means of operation and mechanical interlocks are the only real safeguards.

Contactors subjected to loads of 4,000 to 5,000 A, which arise when bringing about the reversal of a large synchronous-induction type of propeller motor, are liable to become welded in. Therefore, the hand levers are made to force the contact tips apart if the combined effect of springs and gravity are not sufficient to open them. This type of contactor gear is also suitable for the new patented system of Diesel-electric propulsion which makes use of any number of parallel-connected three-phase alternators for supplying power to the synchronous-induction motor as developed for turbo-electric-propulsion systems.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

The "Sandland" Reflector Unit

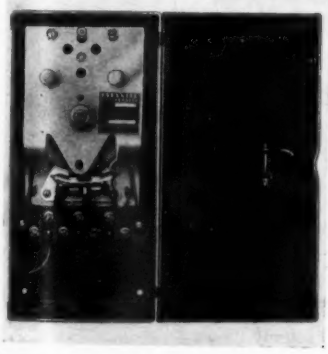
Considerable reflective power is claimed for the new "Sandland" lighting fitting, another advantageous feature being that it is a simple one-piece unit. The totally enclosed opal globe is made of good quality satin crystalline glass. The upper portion of the globe is formed into a reflecting surface by the exterior application of a coating of silver and then one of copper, followed by some synthetic substance, and, finally, a coating which is heat-resisting and water-proof. The glass is preheated before the coatings are sprayed on at a temperature of 300° F., the exterior surface being smooth and washable in the ordinary way.

The "Sandland" reflector

The new fitting is available in 12-in. and larger sizes, with an attractive neat gallery, chromium-plated or in bronze, so formed as to prevent the ventilating perforations casting a pattern on to the ceiling. Comparison by means of a lightometer clearly indicates the intensive directive property of the reflector unit, which is being made by ECA-RAY SALES, LTD., 3, Sandland Street, High Holborn, W.C.1, and is to be distributed by Briton Lamps, Ltd., 3, Rangoon Street, E.C.3.

A Flasher for Novelties

A flasher has been introduced by "BEEANTEE" ILLUMINATIONS, LTD., 88, Goswell Road, London, E.C.1, for novelties supplied by the company, a few of which are a peacock spreading and closing its tail, a bird on a perch moving its tail, a fountain spraying water, a rising sun, a Union Jack waving, and an elephant moving its trunk and its tail and balanced on a revolving ball.



The new "Beeantee" flasher

Two types of flasher are available, a four-way model carrying up to 10 A per way at 100 to 250 V a.c. 50 cycles, having a variable-speed induction motor giving an overall timing cycle of 6 to 15 seconds, with fuses in each circuit and black enamelled watertight housing for wall fixing. It is also supplied with a universal motor from 100 to 250 V.

The second type is a four-way flasher with similar characteristics but suitable for a.c. only, and having a variable speed induction motor giving from 160 to 240 flashes per minute.

"Diamond" Kettles

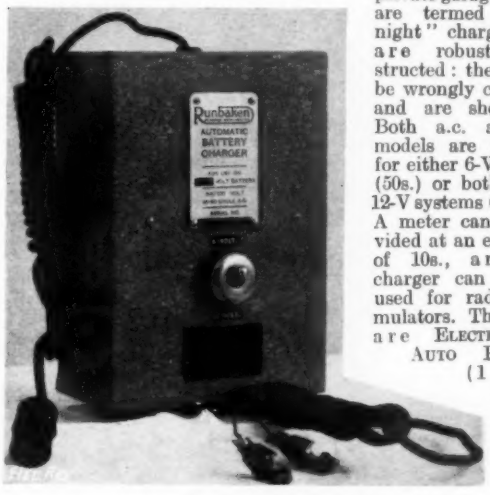
Four new kettles made by the LONDON ALUMINIUM CO., LTD., Westwood Road, Witton, Birmingham, 6, are making their appearance this month. The cheapest model (2 pint, 12s. 6d.) is similar in design to the four-pint kettle used with the porringer which has itself a capacity of two pints. The price of the porringer kettle is 22s. 6d. in polished finish, while without porringer the kettle can be obtained in three- and four-pint sizes.

Another new pattern with a broad base, a "Chromalox" element, and a replaceable thermal cut-out has also been introduced at 20s. (3 pint) and 21s. (4 pint). A spare "cut out" is supplied with each kettle. There is also a stout-gauge aluminium kettle with a 9-in. base designed for use on open type boiler-griller hotplates. It has a capacity of four pints and costs 6s. 6d. with a polished finish. Apart from the last-mentioned model, all the kettles are available with a chromium plate finish at a slight extra cost, and are supplied with an adaptor and connector.

Two new "Diamond" kettles: the porringer kettle and the safety model

Charging Accumulators at Home

The new "Runbaken" types 104Z and 104Y trickle chargers have been designed for the charging of motor car batteries in private garages. They are termed "Overnight" chargers, and are robustly constructed: they cannot be wrongly connected and are shockproof. Both a.c. and d.c. models are available for either 6-V systems (50s.) or both 6- and 12-V systems (62s. 6d.). A meter can be provided at an extra cost of 10s., and the charger can also be used for radio accumulators. The makers are ELECTRICAL & AUTO PRODUCTS (1931), Ltd., 280, Deansgate, Manchester, 3.



The "Runbaken" overnight charger

Coil Wrapping

A new universal coil wrapping machine has been introduced by F. WHITELEGG, 35, Union Road, London, S.E.16. Small coils lie horizontally during wrapping, thus preventing soft materials being deformed. The specification is: maximum coil diameter, outside, 36 in., inside, 4 in.; speed, 100 r.p.m., weight 4 cwt.

"Magnet" Cookers

The new "Magnet" table cooker, manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is designed for occupiers of one- or two-roomed flats, small bungalows, &c., where snack meals and cooking of a light order is the rule. This cooker is fitted with an 8 in. 1,800-W quick boiling plate which will accommodate two or three utensils at a time, and a 1,800-W griller. The hotplate and grill units are each separately controlled by a three-heat switch, and under the hotplate a removable drip tray is fitted, while a grill pan and grid are also included in the standard equipment. The grilling compartment is 10 in. wide, 8 in. deep and 6 in. high. Finished in greycoat porcelain enamel, the cooker costs £4 12s. 6d. with a door and £4 5s. without. A hotplate for very rapid boiling with the higher loading of 2,250 W can be fitted as an extra.

The new "Magnet" table cooker

Another new G.E.C. cooker is No. 1034 for the use of households of from ten to fourteen persons. All the electrical components are interchangeable with others of the "Home Series."

Increased dimensional details are the main features of this new model; the net cooking space of the oven is 16 in. by 18 in. by 17¾ in., the warming cupboard, extending the full width of the cooker, is 21¾ in., and there are three circular totally enclosed hotplates, one 8 in., 1,800 W, and two 7 in. each 1,200 W, and a combined grill-boiler 12 in. by 10 in. 2,700 W,

three standard element formers being employed. The standard equipment comprises oven pan and three withdrawable grid shelves, grill pan, grid and deflector plate, splashguard, thermometer and circuit fuses. In the standard greycoat porcelain enamel finish, with white enamel oven door and switch panel, the price of this cooker is £21.

Switch Sockets

A new series of two- or three-pin s.p. 2-A switch sockets has been placed on the market by Messrs. J. A. CRABTREE & Co., LTD., Lincoln Works, Walsall. Two types of B.S.S. gauge are available, one of which is designed for flush wiring in the narrow ¾ in. skirtings in small houses. A roomy porcelain base encloses the mechanism and fits into a single hole cut in the skirting, no box or excavation of the brickwork being necessary. The rust-proof steel frame to which the base is attached is then fixed to the skirting by four wood screws and covered by a non-rotating "Jacelite" plate, which shrouds the frame and lies quite flat upon the surface.

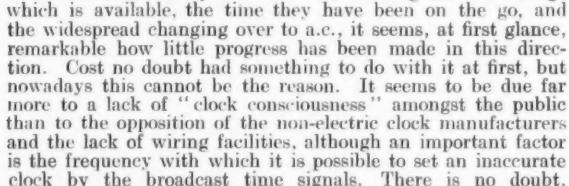
The flush box units differ from the skirting board type in that they are provided with a wood or iron box and a neat mounting frame giving ample overlap. The skirting board units can be adopted for box fixing by the addition of frames and boxes which are listed separately. Two- or three-pin

The new Crabtree switch sockets

units can be obtained in all-brown or all-white at from 2s. 3d. without box to 5s. 1d. each.

Electric Clocks

THERE is in this country an enormous potential market for electric clocks, a market which, up to the present, has been barely touched. Considering the wide range which is available, the time they have been on the go, and the widespread changing over to a.c., it seems, at first glance, remarkable how little progress has been made in this direction. Cost no doubt had something to do with it at first, but nowadays this cannot be the reason. It seems to be due far more to a lack of "clock consciousness" amongst the public than to the opposition of the non-electric clock manufacturers and the lack of wiring facilities, although an important factor is the frequency with which it is possible to set an inaccurate clock by the broadcast time signals. There is no doubt, however, that a big step forward would be made if builders could be persuaded to install one fireplace incorporating an electric clock, or, at the least, a specially positioned plug point. It is taken for granted that the builder has the house wired for lighting, and clock and power



Two "Synchronome" clocks: the "Internalite" illuminated model and the cheap alarm clock

points should be installed as a matter of course. The cost would be a very small fraction of the whole.

The number of clocks available is almost amazing, and a large number of new models have been introduced by the Synchronome Co., Ltd., 19, Caxton House, Westminster, S.W.1. Included amongst them is a 25s. alarm clock (illus.) in an attractive bakelite case, and several domestic models in oak, mahogany, or walnut at from 32s. 6d., embodying many new shapes and styles. These models differ only in external appearance; each has a standard "Synchronomains" movement. Model AC/0491 (illus.) is a typical example, but is only available in oak at 55s., with a 5½-in. matt-silvered dial with chromium bezel. There is also a model with an unorthodox oxidised-silver case with a silvered dial, costing £4 15s. A heavy chromium-plated table-lamp with the clock combined with the stand (65s.) is also a newcomer, as is a grandmother clock costing £9 17s. 6d. in oak.

For public buildings there are dials (illus.) illuminated on the "Internalite" principle of total internal reflection, the light being projected through the edge of the glass on which the dial is etched, while for exposed positions there are new clocks with hermetically sealed cast-iron dials.

The "Chrome Strut" clocks of the Sun Electrical Co., Ltd., 118, Charing Cross Road, London, W.C.2, cost from £1 17s. 6d. (illus.) to £2 2s. Model K112 has a silvered tilting dial with raised chromium figures and hands.

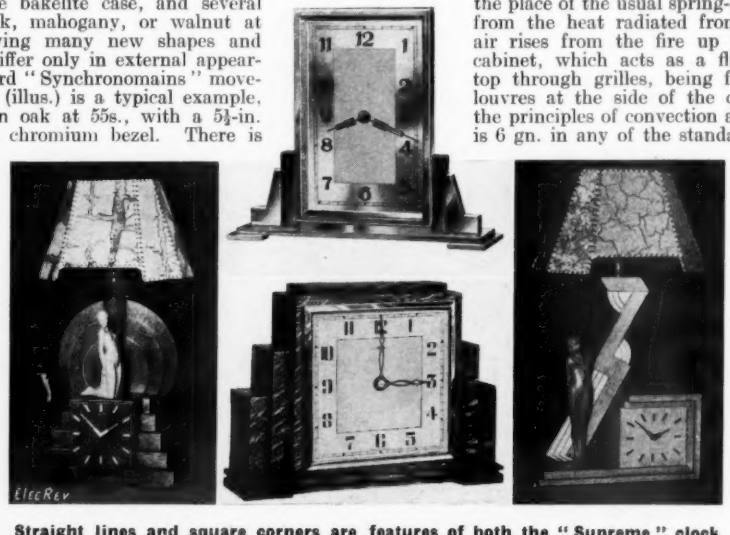
Striking modern designs are features of the new "Supreme" clock-table lamps of Messrs. L. G. Hawkins & Co., Ltd., 30-32, Drury Lane, Kingsway, W.C.2. There are five models available, and all are supplied as standard in solid walnut; oak and mahogany are also obtainable. Although four designs are available, the statuette used for the "Auric" is incorporated in the two others, the kneeling figure being used only for the "Cyclic" model with the block placed centrally. Both cost 6 gn. The same "Cubic" clock is obtainable alone for £2 7s. 6d.

A speciality of somewhat topical interest is the "Marina," which is housed in ¼-in. plate glass, the front glass being a model of the clock face of Westminster Abbey, while the panel forming the back of the clock rises above the face and bears a perspective representation of the two western towers of the Abbey.

The "Klokheta"

The "Klokheta" is of a most unusual design; it combines an electric clock and a radiator. The case is similar to that of a "grandmother" clock, but a 1-kW fire, with a vertical rod element in front of a parabolic reflector is fitted at the base, while a self-starting synchronous clock takes the place of the usual spring-driven apparatus. Apart from the heat radiated from the reflector, the hot air rises from the fire up the inside of the clock cabinet, which acts as a flue and emerges at the top through grilles, being further distributed from louvres at the side of the cabinet, thus combining the principles of convection and radiation. The price is 6 gn. in any of the standard finishes of dark oak, walnut and gold bronze, any special finish being available at an extra cost. Either a 600-W or a 1,000-W element can be be obtained incorporated in the "Klokheta," which is made by the Yorkshire Switchgear & Engineering Co., Ltd., Grove Mills, Meanwood, Leeds.

When it is realised that these are only introductions of the last couple of months or so, the immense variety of designs available is immediately apparent.



Straight lines and square corners are features of both the "Supreme" clock lamps, the Synchronome, and (above) the Sunco "Chrome-Strut" clocks

Materials for the Electrical Industry

Non-ferrous metals and rubber

For the following review of the conditions prevailing during 1934 in the markets for materials used by the electrical industry, and the forecast for the present year, we are indebted to the Metal Information Bureau, Ltd. Our similar article of a year ago, and many preceding annual reviews on the same subject, were contributed by the late Mr. L. H. Quin, who was managing director of the Bureau named.

DURING 1934 a number of important developments occurred in the copper position, and at least three of these are likely to leave their mark on the future. The events referred to are: first, Germany's policy of discouraging imports of foreign refined copper, started during March; secondly, the American Copper Code, which came into operation in April; and third, the initial moves made towards the close of the year with a view to arranging a new international output-control agreement. It is not yet certain whether this new control proposal will fructify in the near future, but it has apparently the support of numerous shareholders in British copper-producing concerns, who have formed an Association to bring the necessary pressure to bear on their directorates.

The disappointing rate of Germany's buying of copper during the major part of last year was an ominous development, but as the Reich seems to be gradually adopting a more reasonable economic policy, it is possible that it may improve during 1935. However, the production of aluminium in Germany is being deliberately increased in order to reduce that country's dependence on foreign copper, her own output being inevitably inadequate.

World stocks of copper fell fairly steadily during the first half of the year but towards the latter half the process of attrition slowed up at times. The continuance of the American Code was only assured by primary producers waiving their sales allotments in favour of the secondary and custom producers. Whereas the trend was towards further output reduction in the United States, production was on the up-grade in the Belgian Congo and Rhodesia. The New Year is opening with considerable optimism on both sides of the Atlantic.

Prices of copper wire bars during 1934 were as follows:—January 2nd, £36 10s.; April 3rd, £36; July 2nd, £34 15s.; October 1st, £30 10s.; December 31st, £32.

Lead

The lead market did not experience very lively conditions during 1934. Its chief support was the extraordinarily good demand from the British building industry, but in other countries the position was not so encouraging. The German home trade "boom" which occurred during the first half of the year, involving heavy imports of lead and other raw commodities, was followed by a new policy, necessitated by the monetary crisis, of restricting the consumption of foreign materials to a minimum.

Meanwhile, the London lead price was artificially depressed by the paradoxical effect of the British 10 per cent. import duty. This duty, owing to the automatic inflow on to the market of foreign metal from bonded warehouses whenever prices showed signs of advancing, acted as a sort of one-way valve, permitting prices to decline but not to rise. At the same time, Empire lead was scarce and commanded good premiums.

By the end of the year, producers, consumers and dealers were equally dissatisfied with the duty, and no surprise was expressed when the Board of Trade referred the whole matter to the Import Duty Advisory Committee. Price prospects during 1935 may depend to no mean extent on whether that body can reach a satisfactory decision. It looks, however, as if in any case the excellent rate of lead consumption in our own country will be maintained at least during the opening months of the New Year.

World stocks of lead outside the United States were reduced quite substantially during the past year, and it is claimed by leading producers that the stock position outside America, once regarded as undeniably bad, is now almost normal. The demand for lead for cables seems likely to undergo further expansion thanks to the British Post Office's progressive telephone policy. The following figures show the course of prices for soft foreign lead (prompt) during 1934:—January 2nd, £11 1s. 3d.; April 3rd, £11 10s.; July 2nd, £10 17s. 6d.; October 1st, £10 7s. 6d.; December 31st, £10 13s. 9d.

Rubber

The past year was a notable one for rubber owing to the re-establishment of a compulsory scheme of restriction and control. The spot price opened the year at 4 11/32d. per lb., and prices fluctuated considerably in the early months on rumours and counter-rumours regarding the progress of the control negotiations. The basic tendency was upwards. During March 5¼d. was touched and in April 6¾d. May saw 7 7/16d. quoted at one time, with frantic business and much speculative activity.

The new regulation plan came into force on June 1st and was very comprehensive, covering all territories where there is organised planting. Fresh planting, and the retention of over-large stocks, was banned. Export quotas were arranged on a diminishing scale, falling from 100 per cent. in June to 70 per cent. in December. The tone of prices was less assured during the autumn.

World stocks started the year at 510,360 tons, and rose to 552,500 tons at the end of October. Output during the first nine months of 1934 was heavier than in January-October, 1933, *viz.*, 838,000 tons, compared with 677,750 tons in the first nine months of 1933. Consumption, however, also expanded from 678,000 tons to 779,000 tons. For the first quarter of 1935 the quota has been fixed at 75 per cent.

Tin

The past year opened with the four principal signatory countries to the restriction scheme operating at 40 per cent. of the revised "standard rate," plus a special 4 per cent. quota. Early in the year official approval was given to the Buffer Pool scheme, whereby a special stock of tin was to be created, to be used to "iron out" price fluctuations. In May the Belgian Congo came into the restriction scheme. Quotas were raised by the Tin Committee to 50 per cent. for the six months April-September, but from October 1st the Committee reduced quotas to 40 per cent.

Meanwhile, Germany had been endeavouring to curtail her imports of tin, but apparently not with much success. Interesting news items in the late summer and autumn were the opening of the American Government's investigation into the world tin situation with special reference to United States supplies, and the establishment by the Tin Committee of an advisory consumers' panel. In November, it was announced that a new British tin smelter was to be put up near Liverpool.

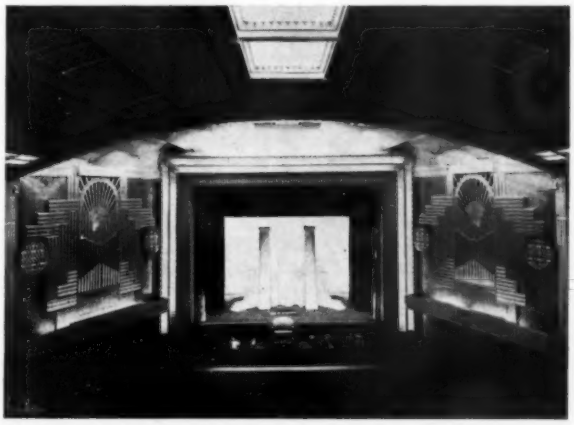
The New Year has opened with the tin situation under strict control, but, as the situation created by the existence of the Buffer Stock is a novel one, prophecy as to the course of prices is difficult. There is some reason to believe, however, that the controlling interests do not contemplate pushing up prices further at present.

The prices of standard tin (cash—mean) varied as follows during the year:—January 2nd, £227 3s. 9d.; April 3rd, £237 7s. 6d.; July 2nd, £226 16s. 3d.; October 1st, £231 17s. 6d.; December 31st, £228 10s.

Spelter

The spelter market suffered during 1934 in a similar fashion to lead from the effects of the 10 per cent. British import duty. Though prices were kept artificially in check by the duty, there was a shortage of Empire brands, particularly for prompt delivery, and these commanded increasing premiums. Germany, after importing zinc on a very good scale during the first half of the year, reduced her foreign purchases and stimulated her home production. She was able to start production in October at a brand-new electrolytic zinc refinery at Magdeburg.

Owing to the virtual closure of the German market and the preferential position enjoyed by British Empire producers on the English market, the outlook for the Belgian and Polish makers grew ominous. On December 31st, 1934, the International Zinc Cartel, which in the middle of the year had



Ornate Holophane lighting at the Forum Cinema, Wythenshawe, Manchester (See page 62)

raised quotas from 50 to 60 per cent. of the "Ostend" basis, collapsed through want of support, but efforts may be made to revive it. Prices may improve somewhat during 1935, especially if a decision to abolish import duty is arrived at.

Virgin spelter prompt was quoted as follows during the year:—January 2nd, £14 12s. 6d.; April 3rd, £14 17s. 6d.; July 2nd, £13 18s. 9d.; October 1st, £12 3s. 9d.; December 31st, £11 17s. 6d.

Aluminium

The aluminium market wore a steady aspect throughout 1934. The situation remained under comparatively good control, but during September the International Aluminium Cartel raised Germany's quota from 40,000 tons to about 55,000 tons a year in order to meet the special conditions in that country, Germany being resolved to use more aluminium and less copper.

The British import duty on certain semi-finished products was raised at the end of August to 15 per cent., but this had little effect in keeping out foreign material and English interests are trying to secure Government consent to still higher duties.

A factor of uncertainty is being created by the gradual emergence of new producing plants in Sweden, Russia and the Japanese Empire. It seems likely, however, that failing unexpected developments, the Cartel will be able to keep up prices during 1935. The price of aluminium ingots was maintained at £100 per ton during the year.

Indian Electrical Trade Prospects

Indications of improvement

NOT a little encouragement for the electrical manufacturer and exporter is to be found in the report for 1933-34 on prospects of United Kingdom trade in India, by Sir Thomas M. Ainscough, H.M. Senior Trade Commissioner, which has recently been issued by the Department of Overseas Trade (price 4s. net). Although imports into India of electrical machinery are still approximately no more than 50 per cent. of what is called normal, the Trade Commissioner finds indications that the continuous decline which has taken place during the past five years will shortly be checked. Two or three moderate-sized hydro-electric schemes are, he says, likely soon to materialise, while the extension of existing power supplies to the smaller towns and the provision of new projects cannot be long deferred.

Although a revival in the demand for plant is naturally contingent upon the restoration of India's agricultural position and the revival of her industries, when this takes place Sir Thomas Ainscough believes that there will probably arise a considerable demand for transmission lines, small industrial motors, &c., in the Punjab, United Provinces and Madras, where bulk power is available at a reasonable rate, and he takes the view which he has expressed on previous occasions, namely, that the local organisations of United Kingdom firms should be able—with their unrivalled experience and connections—to take the fullest advantage of coming developments. German competition has been largely in industrial motors and miscellaneous plant purchased by the Indian bazaars; while the United States maintained its position between 1932-33 and 1933-34 largely through the fulfilment of contracts for undertakings in which American capital is invested.

Benefits of the 10 Per Cent. Preference

The report contains the analysis of the trade during the past three years in the principal groups of apparatus and accessories, according to the country of provenance. In this connection it says that in the face of German and United States competition the 10 per cent. preference on United Kingdom goods has been of benefit, the proportion of the latter rising from 52 to 56 per cent. Italian competition persists in fans; German competition occurs under practically every head but principally in fans, cables, lamps, accessories and miscellaneous apparatus; Dutch imports of lamps are substantial, but arrivals of Dutch cables and wiring are declining; the United States sends mainly lamps, batteries, and electro-medical apparatus; while Japan, in 1932/33, provided bare copper wire, lamps, lighting accessories and fittings.

With regard to the activities of the Indian Stores Department, the period of restricted purchasing which marked 1931, 1932 and 1933, evidently came to an end in 1934. Items of interest to the electrical trade which appear among the engineering and allied stores bought by the Department on behalf of railway administrations, included electric lamps of several different types; train-lighting equipment (with dynamos, batteries, cells, belting and spares); Diesel-electric locomotives; electric fans; transformers, switchgear and switchboards; cables; generating plant; electric meters; and electrical fittings.

The Department is giving every possible encouragement and assistance to locally established engineering industries, and it is noteworthy that among a long list of engineering and allied stores, wholly or partially manufactured in India, there appear considerable quantities of electric cables, electric fans, porcelain insulators, electric cells and accessories and flexible cords.

Radio Material

For the manufacturer of radio material Sir Thomas Ainscough's report contains a number of useful indications. In view of the satisfactory results derived from the short-wave wireless transmitters which have been installed at various headquarters for the Railway Board, further developments of this nature are expected as the Board has found the new system to be much more economical than the renting of land lines. Such short-wave stations, if equipped with telephony also, would do away with the necessity for separate telephone lines between such points.

During the period under review the Bombay Port Trust authorities installed a Marconi wireless beacon at Kennery Island. This is giving every satisfaction and from hundreds of observations which have been made the beacon is proving of considerable benefit to shipping. It is likely to be succeeded by beacons at Calcutta, Karachi, and other points.

Wireless, the report says, will play a very important part in the advance of aerial navigation in India. The Tata Air Service is equipping two of its machines with Marconi aircraft apparatus for the purpose of wireless telephonic communication with the Madras, Santa Cruz (Bombay) and Karachi stations. It is anticipated that great developments will be made both in installing aeroplanes with wireless equipment and suitably equipping aerodrome stations for direction finding and meteorological information.

For orchestral amplification, public speeches and lectures, the demand for public address equipment is steadily increasing as a result of successful demonstrations in recent years. Several complete sets which have been sold to the Indian States are giving every satisfaction.

In the field of beam telephony there is similarly considerable promise of progress. The Indian Radio and Cable Communications Co. has been requested by various administrations to carry out tests with various countries, notably Japan, Java, and British Malaya, and tests are already being arranged. Another projected development is the use of the wireless beam telephone transmitter for short-wave broadcasting, using an omni-directional aerial. By this means the local programmes from the Bombay studio of the broadcasting service could be sent to all parts of India and the world.

But apart from the inter-continental telegraphic and telephonic services there is, in the opinion of the management of the Indian Radio and Cable Communications Co., a potential field for the development of wireless in India itself. It is admittedly suited for police outposts, and various police authorities are considering wireless systems such as have been in operation for some time by the Malabar and Burma police. The Bombay and Calcutta police authorities are also considering the utilisation of wireless for police purposes on the lines already successfully operated by Scotland Yard.

Broadcasting

In the meantime steady progress continues to be made by the Indian State Broadcasting Service with its two transmitting stations at Bombay and Calcutta. A third main transmitting station, at Delhi, is planned, and is likely to be in operation this year. In Madras a British Broadcasting Corporation expert has been advising regarding an extended service. One of the most interesting developments reported, however, is in the villages of the North-West Frontier and the Punjab. Transmitters are being installed in Peshawar and Lahore, together with specially designed simple receiving sets in about twenty villages within a 25-mile radius. If this experiment is successful further transmitters will be erected at other centres.

It is hoped to merge these experiments into a permanent broadcast system with the ultimate objective of a transmitting station every fifty miles or so, with land wires to central stations. Although success depends on surmounting obstacles of a technical and mechanical as well as cultural character, it is evident that, as Sir Thomas Ainscough says, the potentialities for the extension of these rural services in India are illimitable, and United Kingdom manufacturers would, in his opinion, do well to keep in touch with the movement through the medium of their local branches or agents as, in a few years' time, the market for receiving sets is likely to expand considerably.

New Books

Neon. By S. GOLD. Pp. 178; figs. 17. London, Crosby Lockwood & Son, Ltd. Price 7s. 6d.

A neon manufacturing concern has to combine great technical knowledge of the rather obscure operation of the cold-cathode discharge tube (which, to give an idea of the difficulties inherent to the subject, does not obey Ohm's law), familiarity with all the art of the general sign-maker, more than a passing acquaintance with the elements of architecture and experience of advertising psychology, of costing and of financing hire-purchase or hire-maintenance. No one volume of less than two hundred pages can hope to deal effectively with all these, and the author fails in his purpose because he has attempted to produce (to quote the sub-title) "a handbook for electrical engineers, neon manufacturers, sign salesmen and advertisers." The result is incomplete information on nearly every point.

The effect of various types and colours of background is not dealt with, nor is that of certain neon colours on backgrounds—yet two common defects of signs are superimposing tubes on "Staybrite" steel or black glass panels, where reflections annihilate legibility, and using, for example, blue tubes on gold-leafed letters, obtaining thereby a ghastly effect. It is surprising to find no mention in the chapter on background materials of the various excellent asbestos compositions now so widely used.

Much of the information scattered through the book might better have been given in tabular form; the pages devoted to glass-blowing (prefaced with the remark that the art cannot be learned from a book) are hardly likely to be of use to any of those mentioned in the sub-title. Comparative distances for legibility and visibility of different types of letters and diameters of tube would have been far more valuable. An omission of considerable importance is that of the locked-switch from the low-voltage wiring diagrams, the use of which is obligatory. The author seems to assume that 10,000-V transformers are normal; in practice it is rare (except in the case of helium tubes) to exceed 6,000, and an average would be nearer 4,000.

This book, while not an authoritative guide to modern conditions, is worth a place on the shelf as a popular introduction to an interesting branch of the electrical industry, which should receive an impetus from the Royal Jubilee celebration illuminations.

Lighting Calculations. By H. H. HIGBIE. Pp. 503; figs. 115. London: Chapman & Hall, Ltd. Price 31s.

This book cannot fail to be of the greatest value not only to all who are interested in the training of illuminating engineers but also to those who have themselves to carry out lighting calculations. The author covers the whole of the subject of illumination calculations, and in many cases shows how the formulæ employed are derived from first principles. He illustrates the subject matter of each chapter by several fully worked examples, and then provides the student with a large number of problems of a very varied and highly practical nature.

Rather more space might have been devoted to public lighting in view of the extent to which calculations are used in designing installations. Incidentally, the author gives the impression that in the sinusoidal web, generally employed for plotting isocandle diagrams, the area is not directly proportional to the flux (for constant candle-power). A rather remarkable omission to an English reader is that, although the Russell angle method of calculating total flux is explained, no tables of Russell angles are given, nor is there any problem dealing with this particular calculation. After this it is, perhaps, scarcely astonishing to find that the method is referred to as the "protractor method" instead of, as usual, by the name of the originator, Dr. Alexander Russell.

The book is well produced, and the many complicated formulæ given are remarkably free from errors. There is a good index. Four of the figures, which are really calculating diagrams, are printed separately on tracing paper and are contained in a cardboard cylinder. This is, in some ways, inconvenient, but it is difficult to see how it could be avoided.

The Submarine Cable. By Capt. S. A. GARNHAM and R. L. HADFIELD. Pp. 242; 25 illustrations. London: Sampson Low, Marston & Co., Ltd. Price 10s. 6d.

This book is an attempt, and a very successful one, to describe the romance of the submarine telegraph cable, combining a popular description with so much of technical detail as is necessary to enable the reader to appreciate some of the difficulties which faced the pioneers. Many yet alive still remember the time when there was no telegraphic communication with France, for it was not until 1850 that the first cable was laid, and then it survived only a few hours for "a fisherman mistook it for a new kind of seaweed and broke it."

Three chapters are devoted to the first Atlantic cable. The attempts commenced in 1857, and in July, 1858, a cable was actually worked, but owing to the belief that currents at high potential were necessary for signalling, the cable was worked at 2,000 V, induction coils 5 ft. long having been installed, with the result that "the signals became weaker and more confused and in October, 1858, the cable became silent for ever."

Lord Kelvin, then Professor Thomson, soon showed how unnecessary this was, and his "mirror-speaking instrument" enabled Latimer Clark, with the aid of a simple electric battery, to transmit signals twice through the breadth of the Atlantic Ocean, a spot of light on the mirror-speaking apparatus moving as much as 12 in. on the scale. A description is given of the several adventures of the *Great Eastern*; finally, success was reached in 1865, when telegraphy across the Atlantic was made possible on a commercial scale at an initial speed of eight words a minute.

Perhaps the most thrilling chapter is that which deals with the war period, when the German transatlantic cables were cut in the English Channel and diverted to France and England. Chapters are devoted to how a cable is made, operated, laid and repaired, and even how a loaded cable works. Two chapters, also, are devoted to deep-sea sounding, and another to the enemies of the cable, among which the toredo is given prominence. We admire the manner in which the authors have given an accurate description in such a form as to hold the interest of the layman.

The book concludes with short biographies of Michael Faraday and of the founders of three great cable-making firms—W. T. Henley, William Hooper and Sir William Siemens. The authors have produced a very fascinating book.

Television, Theory and Practice. By J. H. REYNER. Pp. 196; figs. 88. London: Chapman & Hall, Ltd. Price 12s. 6d.

Mr. Reyner has endeavoured, with considerable success, to write a treatise on television which takes full stock of its myriad difficulties and to assess facts at their true value. The book deals with first principles, and descriptions of apparatus and systems have been made as short as possible (although giving sufficient information) owing to the liability of both methods and systems to become out of date in a very short time.

Continental and American systems are described, a chapter is included on short-wave television and ultra-short wavelengths, and an all too brief chapter is added on "Television To-morrow." The book is admirably illustrated with half-tones and diagrams, and makes an invaluable work of reference for the student and experimenter in this fast-expanding science.

* * *

Shorter Notices

"Rubber: its Anti-oxidants and Preservatives." A bibliography compiled by the Science Library and the Research Association of British Rubber Manufacturers. (Science Library Bibliographical Series No. 151.) London, 1934. Price 5s. net, post free 5s. 7d.—As the Science Library has had the valuable help of the Nederlandsch Instituut voor Documentatie en Registratuur, Imperial Chemical Industries, and the Rijks Rubberdienst, in addition to the advantage of collaboration with the Research Association of British Rubber Manufacturers in the compilation of this work, it is regarded as the most complete bibliography of its subject that has been issued. It is also opportune on account of the rubber exhibition at the Science Museum, South Kensington, which is now open to the public. The scope of the work comprises such subjects as the theory of antioxidants, storage of rubber, corrosion and deterioration, absorption of water and other liquids, action of light, preservation in general, oil-, acid- and liquid-resistant rubber, and antioxidants. The volume has eighty pages and includes about fifteen hundred references.

This year's *Practical Engineer Electrical Pocket Book* (2s. 6d., Oxford University Press) besides containing all the usual features has undergone a complete revision, and the section dealing with lifts has been rewritten by Mr. M. D. Scott, of Marryat & Scott, Ltd., while Mr. H. W. Baxter, A.M.I.E.E., B.Sc. (Eng.), revised and amplified the section on switchgear. Descriptions of the magnetic clutch and the use of magnetism in detecting cracks are now included.

"Neuzeitliche Lichterzeugung" is the title of a new publication by E. Lax which we have received from the V.D.I.-Verlag, Berlin, in the series "Deutsches Museum." The book opens by dealing with the general principles of light and theoretical problems of discharge lighting, leading up to a lengthy section on the modern electric discharge lamp, with particular reference to advertising signs and street lighting. The price is RM 0.90.

The Copper Development Association has sent us a well-produced little booklet on brasses. This is the first of the new "Engineers' Note Book Series," which will deal with brass tubes, wire, castings, stampings, &c. The books are supplied free of charge.

"Electric Circuits and Wave Filters," by A. T. Starr. Pp. 375; figs. 335. London: Sir Isaac Pitman & Sons, Ltd. Price 21s.

"Elementary Electricity and Magnetism," by W. Hutchinson. Pp. 475; figs. 297. London: University Tutorial Press. Price 6s. 6d.

"Electric Power Metering," by A. E. Knowlton. Pp. 340; figs. 215. London: McGraw Hill Publishing Co., Ltd. Price 24s.

"High Voltage Physics," by L. Jacob. Pp. 107; figs. 37. London, Methuen & Co., Ltd. Price 3s.

"Electrical Encyclopædia" (four volumes). Edited by S. G. B. Stubbs. London: Waverley Book Co. Price 70s.

"Faraday's Diary" (Volume 5). Edited by T. Martin. Pp. 456; illus. London: G. Bell & Sons. Price 12 gns. for seven volumes.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

British Plant for Russia

It is reported that the Russian Trade Delegation has been authorised to purchase machinery to a value of £500,000, and it is anticipated that a substantial portion of the orders will be placed in this country, particularly for textile machinery. The delegation is visiting works in Lancashire and Yorkshire, and last week paid a visit to Messrs. Platt Bros. & Co., Ltd.

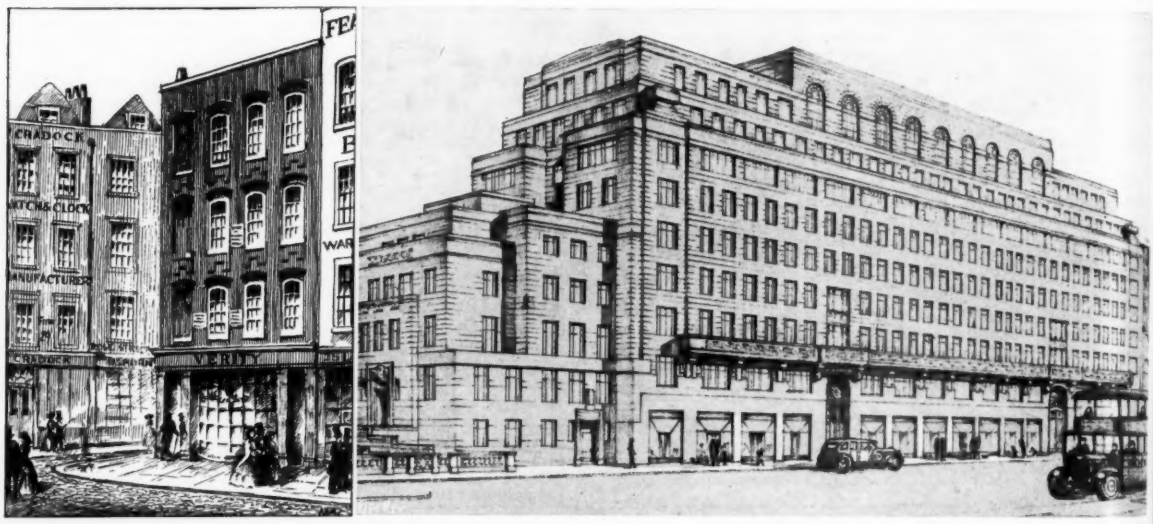
Transport Wages Increase

Tramway drivers, conductors and other grades of uniformed staff on the London tramways are to receive an increase in wages of 2s. per week, commencing with the first full pay week in the current month, and a further 1s. per week from the first full pay week in April.

Discussions are proceeding in connection with the restoration of the " cuts " in the wages of the " Underground " staff.

Verity's Removal from Covent Garden

Messrs. Veritys, Ltd., are at the moment in course of removing from the offices in London that they have occupied for about one hundred and sixteen years—31, King Street, Covent Garden, W.C.—and from Monday next, January 12th, their address will be Brettenham House, Lancaster Place, Wellington Street, Strand, W.C., where they have a suite of offices. As our readers are aware from our previous reference to the subject, the record of the house of Verity in the neighbourhood of Covent Garden market (which, by the way, has been continually encroaching) is a very interesting one, and a change-over in 1935 from a home which was first entered as long ago as the year 1819 is the only event of its kind that we have ever had to record in the ELECTRICAL REVIEW. The 1819 picture which we are enabled to reproduce from a very old print will to some extent also reproduce the atmosphere of those very different "good old days" when the business was started, and will serve to contrast the ancient with the quite modern, which is illustrated in the view of Brettenham House, where the increasing electrical activities of Veritys, Ltd., will, we hope, be conducted for another 116 years. The change has been made because of the need for premises to meet their present-day requirements, and in spite of the fact that they still hold a long lease of the old premises.



Messrs. Veritys, Ltd., after 116 years, are leaving their original premises (left) for Brettenham House, W.C.2 (right)

Shanghai Commercial Counsellor's Visit

The Department of Overseas Trade announces that Mr. L. B. Beale, C.B.E., the Commercial Counsellor at Shanghai, is at present in this country on an official visit. He will be available at the Department of Overseas Trade for the period January 14th-18th, for the purpose of interviewing manufacturers and merchants interested in the export of the United Kingdom goods to China, after which he will visit a number of industrial centres in the provinces. Firms desiring an interview with Mr. Beale in London or information regarding his arrangements to visit provincial centres, should apply to the Department, 35, Old Queen Street, London, S.W.1.

The International Telegraph Companies' Association

One of the cable companies in the International Telegraph Companies' Association has announced its intention to withdraw from the Association, as a matter of policy, and according to the *Financial Times*, as a result, it has been decided to dissolve the Association as from December 31st last. The same authority states that it is understood that the withdrawal of the member was due to developments aiming at the merger of all systems in the United States. The view has been expressed in various cable quarters that a price-cutting war is not to be expected. The Association was formed in 1925 to deal with matters of common interest to the members, and at its formation it comprised the principal submarine cable companies, both British and foreign. At its dissolution its membership included all the cable telegraph companies throughout the world, either directly or through parent concerns, and also the world's leading wireless companies. The director and adviser of the Association was Mr. F. J. Brown, who took up the position upon his retirement from the Post Office.

A Mercury Rectifier Film

Glass-bulb mercury-vapour rectifiers aggregating 250,000 kW in capacity are said to have been made by the Hewittic Electric Co., Ltd., which claims to have supplied 98 per cent. of the glass-bulb rectifiers installed in this country and to have made the largest of this type in the world, now in use for railway traction in England. Apart from the making of the " Pyrex " glass and the actual blowing of the bulbs, the manufacturing processes are carried out entirely in the company's works at Hersham, Walton-on-Thames, Surrey, including the making of electrode seals, attachment of the anode arms, exhaustion, testing of component parts and completed units, fabrication by electric welding of the steel cubicles, and the wiring-up of auxiliaries, the necessary chokes and transformers being made by the associated Hackbridge Electric Construction Co., Ltd. The specialised craftsmanship required for the manufacture of these glass-bulb rectifiers is well demonstrated by a cinema film which has taken over six months to complete. It shows the various stages of fabrication, step by step from the intricate glass blowing to the testing of the finished unit, and finally some of the varied applications of this type of rectifier. The film is to be exhibited twice daily during the week commencing January 14th in the Western Electric Co.'s theatre, Bush House, Aldwych, and later at other centres throughout the country. No tickets are required.

The Lighting of a Manchester Cinema

The new Forum Cinema, Wythenshawe, Manchester, includes new methods of lighting, the colour lighting being especially attractive. Special designs of moulded plaster work have been incorporated in the splay walls, which are in full view of the audience. As the picture on page 59 shows, the plaster flutes are of varied design and are lighted from three directions: one from the ceiling vertically downwards, one from the sides concealed in vertical turrets, and the third from the bottom balcony ledge and behind the organ grille. This new system is used in conjunction with an automatic switchboard called the " selector-controller," and Holophane special " E "-type and large-type " Collosa " battens were used.

Educational Films

In connection with the twenty-third annual conference of Educational Associations the British Film Institute gave a demonstration of educational films at the Phœnix Theatre, London, last week, which indicated in a convincing way how great an aid the cinema might be to the teaching profession. Of the nine films exhibited, " The Wizard in the Wall " is one of the E.D.A. propaganda series. Another by the Western

Electric Co., Ltd., is an excellent illustrative presentation of the molecular theory of matter. Introductions to the subjects of "Machine Tools: the Milling Machine" and "Mensuration: Solid Geometry" were presented by Stuart Films, whose "Electricity" has been made with the technical advice of Dr. Geoffrey Martin solely for use in schools, the first part conveying a graphic idea of fundamentals and the second illustrating experimental effects. G. B. Instructional, Ltd., showed a popular edition of "How Talkies Talk," a record of the principles and technique of sound recording, while "The Amœba" is the first of an important series being made under the supervision of Prof. Julian Huxley for teaching biology.

A Water-heating Campaign at Nottingham

It is frequently assumed that the summer months are the most favourable for selling electric water-heating equipment, but Nottingham Corporation Electricity Department is of opinion that the opportunities for increasing the water-heating load are equally great in winter and in conjunction with the Nottingham office of the Hotpoint Electric Appliance Co., Ltd., has launched a campaign to further the sales of hot-water circulators. As a part of the campaign the Department allocated a window to hot-water circulators and distributed with its December accounts leaflets specially produced to "tie up" with the window display. The accompanying illustration depicts the window, the predominant colours of the display material being red and green.

Italian Electrical Imports and Exports

The imports of foreign electrical machinery and apparatus into Italy during the ten months ending with October last attained a value of £1,441,480 (at 57¼ lire to the £) as compared with £1,511,495 in the corresponding period of 1933. During the same period there was also a decrease in the exports of similar material from Italy, from £621,915 to £534,645.

A "Hotpoint" water circulator display at the Nottingham electricity showrooms

New Plant at Willesden and Battersea

To enable the London Power Co. to make the most effective and economical use of the turbine plant installed and sanctioned, and to make provision for the increasing requirements, it is proposed to spend over £418,000 at Willesden and Battersea power stations. Two boilers with an evaporative capacity of 90,000 lb. per hour are to be installed at Willesden at an estimated cost of £68,000, and three boilers each with an evaporative capacity of 300/375,000 lb. per hour are to be installed at Battersea at an estimated cost of £350,000.

Social Events

The Bruce Peebles Social and Sports Club recently held a fancy dress dance at the company's works canteen, Edinburgh. The accompanying illustration shows a group of the dancers, and includes Mr. J. W. Rodger, chief engineer and works manager, Mr. G. Henderson, assistant works manager, Mr. R. P. Hilton, chief sales engineer, and Mr. W. H. Morton, secretary.

The Lothians Electric Power Co. held its annual dinner and dance in Edinburgh on December 14th. Mr. A. B. Mavor was in the chair and there were many distinguished guests, who

A group at the recent Bruce Peebles fancy dress dance

included Lord Provost and Lady Thomson, Mr. H. C. Drayton, director of the Electrical Finance & Securities Co., Mr. W. McFarlane, of the Central Electricity Board, and several public officials of the area supplied by the company. Mr. R. Watson, of the Edinburgh Corporation Transport Department, proposed the toast of the Lothians Electric Power Co., paying tribute to its general manager and his assistants for overcoming the many difficulties connected with supply to a rural area. Replying for the company, Mr. H. C. Babb stressed the way in which the company had striven to give every possible satisfaction to its consumers, and said that the question of charges was always kept in mind. The fact that the saturation point of consumers connected had not yet been reached was shown by the fact that the past year constituted a further record in the number of new consumers connected to the mains. Mrs. A. B. Mavor presented the cup to Mr. R. J. Innerd, this year's winner in the golf section of the company.

Anglo-Soviet Trade

The possibilities of the Russian market are becoming increasingly important and the booklet on Anglo-Soviet trade which has been issued by the Russo-British Chamber of Commerce should therefore be of considerable interest to electrical manufacturers and exporters. The publication contains a summarised version of the Anglo-Soviet Trade Agreement, and gives a list of Soviet organisations in London. Particulars of machinery and equipment (with values) purchased by Russia in the United Kingdom during the years 1931-33 and the first nine months of 1934 are included, and details of the activities of the Chamber are also given. Informal luncheons have been arranged by the Chamber with the object of establishing closer contact between buyers and sellers in trade between the United Kingdom and the Soviet Union. The president of the Chamber is Mr. L. E. Mather, of Messrs. Mather & Platt.

Recent Contracts

Among orders recently received by International Combustion, Ltd., are those for dust and grit disposal plant for Birmingham Corporation Electric Supply Department, and ash-handling plant for the Stuart Street power station of Manchester Corporation.

The English Electric Co., Ltd., has been awarded the contract for the supply, erection and operation of the Diesel generating plant which will provide the complete power requirements for the British Pavilion at the International Exhibition, Brussels, 1935. The plant will consist of two six-cylinder English Electric "K"-type Diesel engines, direct coupled to English Electric 200-kW alternators, generating power at 400/230 V, 3-phase, 50 cycles. The plant will include all the associated switch and control gear and engine-room accessories. The power station will be operating within the main exhibition hall in full view of all visitors. Some of our readers will recall that the power station at the British Empire Exhibition at Wembley in 1924 and 1925 was arranged on similar lines in the Palace of Engineering.

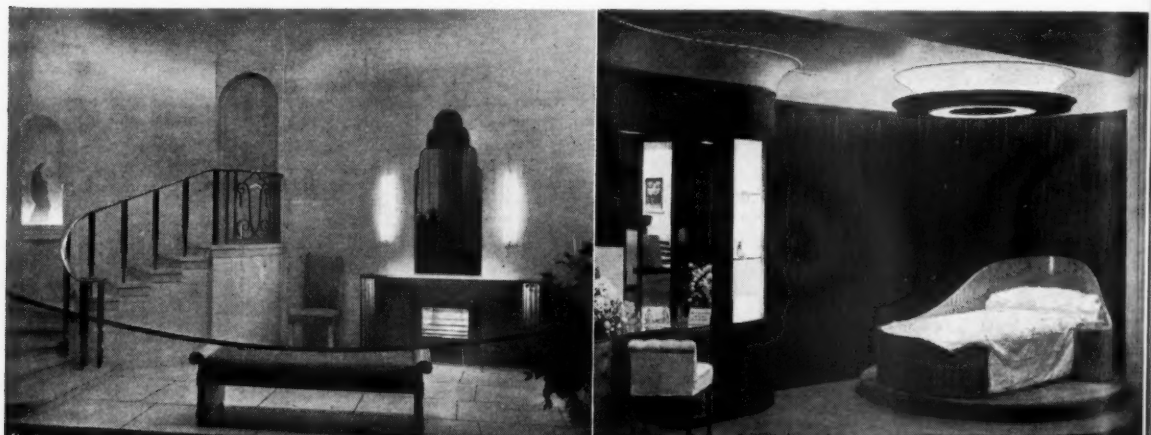
The Work of Ferguson, Pailin

Much of the present activity of Messrs. Ferguson, Pailin, Ltd., is centred in the production of light metal-clad switchgear, and there is a considerable demand for low-voltage thermal cut-outs for the control of small motors. A large number of orders have recently been obtained also for heavy-duty switchgear fitted with cross-jet explosion pots, in which the gas generated in the early portion of the opening stroke propels clean oil at high velocity across the contact gap at the moment of zero-current pause. These have been applied to the seventy circuit-breakers supplied to Stuart Street power station (Manchester), which include 750,000-kVA generator units in which two three-phase breakers are housed in a common tank to permit rapid change-over from one set of busbars to another without interrupting the load, the operation being performed from the control room. On the 500,000-kVA feeder switchboard a similar change-over is effected by lowering the breaker from one bus-bar and replugging it into another. A contract for the paper mill of Edward Lloyd, Ltd., comprises nineteen 500,000-kVA cellular generator units and eighteen l.v. metal-clad units. The 33-kV equipment for the Tir John power station (Swansea) is designed to control two 37,500-kVA alternators, four feeders and one house set. Each machine unit is made up of two breakers for bus-bar change-over without interrupting the circuit. All the bus-bars, instrument transformers and connection chambers are oil-filled with two con-

servators on each unit. A feature of the 33-kV and l.v. switchgear for John Bibby & Sons, Liverpool, is that the breakers are operated by a thermal gas-closing mechanism to permit non-manual operation without the use of solenoid or motor. The seven l.v. 3,500-A switches have a duty corresponding to 750,000 kVA at 6.6 kV. Other large contracts include those for the West Midlands J.E.A., Liverpool Corporation, the London Power Co., the St. James's & Pall Mall Co., as well as for various places in India, South Africa, and South America.

Art in Industry

The Exhibition of British Art in Industry was opened at the Royal Academy last week. The object of the exhibition is to show the need for improvement in the design and colours of articles which are produced mechanically for ordinary domestic use, and there are many examples showing the striking advances that are being made in many departments of British manufacture. From an electrical point of view lighting predominates and a series of specimen rooms contains lighting fittings both artistic and original in design. Among the electrical manufacturers who are exhibiting such fittings are the General Electric Co., Ltd.; Best & Lloyd, Ltd.; J. Clarke & Sons, Ltd.; and J. Wedgwood & Sons, Ltd. The chandeliers in the vestibule were made by Messrs. Troughton & Young, Ltd., who were also responsible for some of the general lighting. In the dress materials gallery there are four electroliers manufactured by Messrs. F. & C. Osler, Ltd., and exhibited by Messrs. Osler & Faraday, Ltd., who are also exhibiting an octagonal pendant fitting in the carpet section. In the commercial printing gallery the lighting is provided by the "Whiteway" picture lighting of Messrs. W. R. White & Co. A section devoted to clocks includes a number of electrically operated models, the exhibitors including Thomas de la Rue & Co., Ltd. (manufacturers, Telephone Manufacturing Co.); the Bulle Clock Co., Ltd.; and Smith's English Electric Clocks, Ltd. Other electrical apparatus in the specimen rooms include an electric fire in the dining room exhibited by the Inventum Electric Appliance Co., an electric radiator by Messrs. Bratt, Colbran & Co., and the Heaped Fire Co., in the sitting room, and an electric fire in the hall by Mr. R. M. Catterson-Smith. The only electrical apparatus which we saw among the kitchen equipment was an electric heat-storage type cooker, manufactured and exhibited by the General Electric Co., Ltd. The exhibition closes on March 9th.



Two of the specimen rooms at the Royal Academy Exhibition of Industrial Art, showing a specially designed electric fire and bedroom lighting

Trade Announcements

Mr. A. Wortley has opened an electrical wholesale business as the Sutton Wholesale Electrical Co. at 364, High Street, Sutton. He asks for manufacturers' catalogues and lists.

Mr. W. S. Wells, electrical and wireless engineer, of Witney, has removed his business to 3, High Street, Witney.

For Sale

Sheffield Corporation Transport Department has for disposal thirty traction motors.

(See our classified advertisements.)

Calendars, Diaries, Etc.

The calendar of Messrs. E. N. Mason & Sons, Ltd., has large monthly sheets with calendars for 1934 and 1936 on the back.

Barrett, Tagant & Gotts, Ltd., have sent us a calendar for the desk or wall, with daily slips.

The calendar received from British Jeffrey-Diamond, Ltd., has monthly slips, on each of which appears an illustration of mining equipment manufactured by the company.

The neat little calendar of Messrs. Thomas R. Hills, Ltd., has tear-off slips with six days on each slip.

The little maid using the telephone makes a pretty study for the calendar of Brittain's Electric Motor Co. (formerly Langdon Davies), from whom we have also received a business calendar with large monthly slips.

As in preceding years the portrait of an attractive girl adorns the calendar of Messrs. Downes & Davies.

A goblin perched on top of a globe forms the calendar of the British Vacuum Cleaner & Engineering Co., Ltd., which has large daily tear-off slips.

The calendar of Messrs. Ransome & Marles Bearing Co., Ltd., has both daily and monthly slips, and illustrates some of the company's products.

The calendar of the Poplar Borough Council Electricity Department bears an illustration of the Department's showrooms, reproduced from an ELECTRICAL REVIEW photograph.

Prices of Materials

Messrs. F. Smith & Co. report, January 9th: Electrolytic copper bars, £32 5s., £1 15s. increase. Ditto, ditto, wire rods, £36, 10s. increase. Ditto, ditto, h.c. wire, $6\frac{7}{16}$d., $\frac{3}{16}$d. decrease. Silicium bronze wire, $7\frac{1}{4}$d., $\frac{1}{16}$d. increase.

Messrs. James & Shakespeare report, January 9th: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Electrolytic copper sheets, £31 15s. to £32 5s.

Messrs. Edward Till & Co. report, January 9th: No change in the price of India-rubber, Para fine.

New Catalogues and Lists

Synchronome Co., Ltd., 19, Caxton House, Westminster, S.W.1.—A leaflet on mediæval art in modern turret clocks.

Furn-Art, Ltd., Sarnesfield Road, Enfield.—Catalogues of decorative fittings, lampshades and neon signs.

Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London.—A broadsheet on batteries.

Ferranti, Ltd., Hollinwood.—An electric clock showcard.

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, E.C.1.—A showcard for the "Efesca" minor vacuum cleaner.

Simplex Electric Co., Ltd., 159, Great Charles Street, Birmingham, 3.—A new catalogue of conduit fittings.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—A display card for the "Coolicon" lampshade and a pamphlet on electric-discharge lighting.

Revo Electric Co., Ltd., Tipton.—A leaflet on the new 2-kW "Tubular" fire.

Siemens Electric Lamps & Supplies, Ltd., 38/9, Upper Thames Street, E.C.4.—A catalogue of glassware, shades, &c.

Sloan Electrical Co., Ltd., 8/12, Golden Lane, E.C.1.—A catalogue of insulators, line material and tools.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Particulars of the new "Five-Eighty" radio receiver.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Details of the new sizes of coiled-coil lamps.

G. P. Cosway, Ltd., Coton Road, Nuneaton.—A catalogue of disconnecting boxes, joint boxes, dividing boxes, feeder pillars, overhead line switchgear, &c.

Adamson, Green & Co., Ltd., St. Bedes Electrical Works, Sunderland Road, Felling-on-Tyne.—A booklet on "Rural Electrification."

Bankruptcy Proceedings

C. F. Du Bock, electric lamp distributor, trading at Ridley Road, Forest Gate, and formerly at Orme House, Romford Road, Forest Gate, as "Bright Electric Co."—The first meeting of creditors was held on Monday last at London Bankruptcy Buildings. The receiving order was made on December 21st upon the petition of British Crystal Lamp Co., Ltd., creditors for £215. The debtor, who returns liabilities of £1,101 against assets of £21, states that in July, 1933, he was appointed sole distributor of the "Fenbo" crystal lamps for East London. He attributes his failure to withdrawal of support by the petitioning creditors, ill-health and insufficient capital. The case was left in the hands of the Official Receiver.

E. H. Goldie, "Dunkerque," The Parade, Dudley, Worcs., formerly trading as the "Dudley Radio and Electrical Service," Castle Street, Coseley, Staffs, radio engineer.—The public examination was resumed recently at the Court House, Dudley. The previous hearing was held in May, 1934, when debtor was ordered to file a cash account. In reply to questions he said

that several of his books had been destroyed, and his deficiency account was only an estimate. His liabilities amounted to £419, and there was a deficiency of £348. He attributed his failure to bad debts, theft of stock, and living in excess of the profits. The Registrar adjourned the examination *sine die*.

W. J. Davies, radio and electrical engineer, 230, Great North Road, Woodlands, Doncaster.—Trustee, Mr. F. E. Bendall, 27, York Street, Sheffield, appointed December 22nd.

E. S. Mellor, electrical engineer, 15, Cole Street, Scunthorpe.—Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby, Official Receiver, released December 28th.

A. G. Overton, electrical engineer, 75A, Pasture Street, Great Grimsby.—Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby, Official Receiver, released December 18th.

T. P. Kelly (trading as Jack Kelly), wireless dealer, 153, Brookmill Road, Deptford, S.E.—Trustee, Mr. F. T. Smith, 150, Southampton Row, W.C., released November 16th.

A. Leach, radio dealer, 4, Market Street, Otley.—Last day for receiving proofs for dividend January 15th. Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver.

H. Fraser and **R. J. Ardern** (Ardern & Fraser), electrical appliance dealers, 29, Church Street, Accrington.—Last day for receiving proofs for dividend January 19th. Trustee, Mr. J. Longthorn, 28, Queen Street, Great Harwood.

Company Liquidations

Harden Cartwright, Ltd., 19, Albion Street, Brierley Hill, Staffs, manufacturing engineers and wholesale electrical suppliers.—The meeting of creditors was held recently at the offices of Messrs. Poppleton & Appleby, Midland Chambers, Warwick Passage, Corporation Street, Birmingham, when it was reported that the shareholders had passed a resolution nominating Mr. F. E. Bendall, of Messrs. Poppleton & Appleby, as liquidator of the company. A statement of affairs was submitted at the meeting showing liabilities of £951 and net assets of £435, leaving a deficiency of £516. The company was incorporated on October 25th, 1923, with a nominal capital of £1,000, to take over a business formerly carried on by Mr. H. Cartwright, for a consideration of £460, satisfied as to the allotment of 60 ordinary shares and four debentures of £100 each. In May, 1927, the company discharged debentures up to £100. During the year to June 30th, 1930, the sales were £4,149, the gross profit was £96, and there was a net loss of £73. In each succeeding year down to June 30th, 1934, the company had sustained net losses. In July, 1934, some creditors commenced proceedings, and the debenture holders appointed a receiver, who had realised a certain portion of the stock and collected a number of the book debts. He had discharged the debentures of £300 with interest. The directors attributed the present position to intensive competition and general depression. The creditors passed a resolution confirming the voluntary liquidation of the company with Mr. Bendall as liquidator.

Regentone, Ltd., radio and electrical engineers and manufacturers, Isleworth.—The statutory meeting of creditors was held on January 4th, at the Connaught Rooms, London, W.C., when Mr. Nunn, the chairman and managing director of the company, presided. A statement of affairs was submitted, which disclosed gross liabilities of £33,720, of which £32,810 was expected to rank for dividend; unsecured creditors represented £18,281, and the Regent Radio Supply Co. was a creditor for £14,500. The net assets were £9,689, leaving a deficiency of £23,120. Mr. Nunn said that at a meeting of shareholders a resolution had been passed for voluntary liquidation, and Mr. A. E. Attwood, of the British Traders' Association, Balfour House, Finsbury Pavement, E.C., and Mr. Charles Latham, 78, New Oxford Street, W.C., had been nominated joint liquidators. A creditor's representative asked what was the exact relationship between Regentone, Ltd., and the Regent Radio Supply Co., and the chairman said that they were separate entities and he was the sole partner. Continuing, Mr. Nunn said that Regentone, Ltd., obtained orders at the last Radio Exhibition for about £32,000. It was hoped to deliver in August and September, but the company was not able to start delivery until the following October. By that time a large number of the orders had become void. In order to cope with those orders it was necessary to book a considerable quantity of raw material. When the sets did go out about a thousand receivers were returned as faulty, and in order to put them right the company had been involved in further expense. The appointment of Messrs. Attwood and Latham as joint liquidators was confirmed, and a committee of inspection was also appointed.

Nuvolion Electrics, Ltd.—Winding up voluntarily with a view to amalgamation. Liquidator, Mr. R. G. Adams, Mole Side, Lower Duxhurst, Reigate. All debts will be paid in full.

W. R. Loxley & Co. (General Products), Ltd.—Winding up voluntarily. Liquidator, Mr. A. J. Baker, 106, Fenchurch Street, E.C.

Southern Auto Electrical Co., Ltd.—Meetings February 2nd at 1, High Street, Croydon, to receive an account of the winding-up by the liquidator, Mr. F. S. Parsons.

Rugby Electrical Engineering Co., Ltd.—Meetings January 14th at 11A, Regent Street, Rugby, to receive an account of the winding-up by the liquidators, Messrs. G. H. Scott and A. Cripwell.

Brown & Oliver (Wireless), Ltd.—Meetings January 29th at Kimberley House, 14-17, Holborn Viaduct, E.C., to receive an account of the winding-up by the liquidators, Messrs. P. S. Booth and W. H. French.

John H. Wilson & Co. (1929), Ltd.—Winding up voluntarily. Liquidator, Mr. S. Colvin, 6, Castle Street, Liverpool.

Dissolutions of Partnership

Dynamotor Repair Co., electrical repairers, 27-28, Sydney Grove, E.C.—Messrs. J. L. Enzer and J. G. Patrick have dissolved partnership. Mr. Enzer will attend to debts and carry on the business.

Howick & Morgan, radio specialists, 4, Bridge Parade, Purley.—Messrs. F. A. Howick and L. L. Morgan have dissolved partnership. Mr. Morgan will attend to debts.

Chile's Electrical Imports

THE gradual but steady improvement that is taking place in the export trade of the principal South American countries, in conjunction with the relaxation to some extent of exchange restrictions, is prompting a certain revival of interest in import business. In 1933, the latest period for which detailed statistics are available, Chile's total imports of electrical apparatus were valued at approximately £121,375, or £62,000 below the value in 1932. But while the shares of Germany and the United States, which together were responsible for more than two-thirds of the total trade, declined by nearly £27,000 and £45,000 respectively, that of the United Kingdom slightly improved.

From the following statement of the principal items of import it may be possible to see in what lines the British position might be further improved. The figures are in Chilean pesos of 6d., and notes of increases or decreases as compared with 1932 are given where possible. In the case of wireless material, imports of which increased substantially between 1932 and 1933, such comparison is not practicable owing to changes in Customs classification.

	1933. $ of 6d. (Thous.).	Inc. or dec. $ of 6d. (Thous.)
Lamps—		
Total	1,750	− 76
From Germany	630	− 114
„ United States	481	− 258
„ Holland	202	+ 81
„ United Kingdom	11	− 10
Earphones—		
Total	124	(3)
From United States	112	—
Wireless valves—		
Total	80	(3)
From United States	25	—
„ United Kingdom	22	—
„ Holland	25	—
Telephone apparatus—		
Total	96	− 64
From United States	40	+ 9
„ United Kingdom	11	− 74
Telegraph apparatus—		
Total	16	− 23
From United Kingdom	12	+ 12
Radio-telegraph apparatus—		
Total	18	(3)
From United Kingdom	9	—
Radio transmission apparatus—		
Total	16(2)	(3)
Radio receiving apparatus—		
Total	556	—
From United States	512	—
Cookers—		
Total	3	− 63
Motors—		
Total	216	− 121
From Germany	20	− 176
„ United States	93	− 13
„ France	24	+ 19
„ United Kingdom	5	− 2
„ Sweden	47	+ 33
Turbines—		
Total	45(1)	− 145
Insulators—		
Total	15	− 130
Cables—		
Total	456	− 1,061
From United States	161	− 857
„ Germany	127	− 153
„ Belgium	108	+ 44
„ United Kingdom	36	+ 13
Insulated wire—		
Total	70	− 4
From United States	32	+ 11
„ Germany	14	− 3
„ Belgium	13	+ 11
Insulating tubes—		
Total	166	+ 42
From Germany	121	+ 56
„ France	17	+ 17
„ United States	3	− 13
„ United Kingdom	—	− 11
Carbons and electrodes—		
Total (2)	275	+ 154
Dynamos—		
Total	14	− 51
From Germany	7	− 57
Unspecified electrical machinery—		
Total	116	+ 90
From United States	—	− 11
„ Germany	102	− 88
Alternators—		
Total	41	+ 26
From Italy	—	− 7
„ France	36	+ 36
Convertors—		
Total (2)	4	− 10
Transformers—		
Total	44	− 607
From Germany	7	− 285
„ United States	16	− 339
„ United Kingdom	17	+ 15
Resistances—		
Total (2)	59	− 6
Rheostats—		
Total	30	+ 22
From United States	22	+ 20
„ Sweden	5	+ 3
Unspecified electrical apparatus—		
Total	131	− 147
From Germany	29	− 194
„ United States	31	− 21
„ United Kingdom	71	+ 70
Current meters—		
Total	164	(3)
From United States	59	—
„ Switzerland	50	—
Batteries—		
Total	111	− 91
From Germany	13	− 22
„ Denmark	20	+ 1
„ United States	67	− 68
„ United Kingdom	8	+ 6
Accumulators—		
Total	200	− 27
From United States	145	− 54
„ France	31	+ 31
„ United Kingdom	14	+ 10

(1) All from France. (2) Largely from United States. (3) Not specified.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—BOILER PLANT IMPROVEMENTS.—At the instance of the city electrical engineer, the Electricity Committee has placed before the Council a scheme for improving the boiler plant at the electricity works, Ferryhill, at an estimated cost of £60,000. It is planned that the old boiler house shall be replaced by an extension of the new building, including two new high-pressure boilers and auxiliaries having a total output of between 100,000 lb. and 120,000 lb. of steam per hour.

Addiewell (Midlothian).—NEW POWER STATION.—A new power station is to be erected by Messrs. Young's Oil Co. at the Addiewell works to generate electricity for a pit which is to be sunk by Scottish Oils, Ltd., near West Calder, for the development of shale oil.

Altrincham.—COMPANY'S TENURE.—The Urban District Council has accepted the terms of Altrincham Electric Supply, Ltd., for an extension of tenure for a period of ten years as from 1935.

Ashton-under-Lyne.—ILLUMINATIONS AID SALES.—Traders in Ashton-under-Lyne report that in consequence of the illumination season sales have been heavier and have justified the Chamber of Trade's slogan, "Trade Follows the Lights." Shopkeepers have reported increases in revenue by as much as 25 per cent. About 200,000 more people used the buses and tramcars than in the same period last year.

Australia.—KALGOORLIE.—The Electric Power and Lighting Corporation has decided to install a new 5,000-kW turbo-generator, together with auxiliary plant, to meet the increasing demand for electric power and to provide efficient reserve plant. The cost is estimated at £40,000. It has been decided to issue 49,990 ordinary shares of 10s. each at the price of 14s. per share. The capital was increased to £125,000 in July last, when 100,000 ordinary shares of 10s. each were offered to ordinary shareholders at par.

Barnstaple.—RURAL ELECTRICITY.—An application was received recently by the Rural District Council from the Braunton Electric Light & Power Co. for consent to extend the overhead cables in the district. During the discussion it was suggested that an agreement should be made requiring the placing underground of cables within, at the most, five years. The Council has referred the matter to the parishes concerned for their observations.

Barton-on-Humber.—CHANGE-OVER.—The Barton-on-Humber Electric Supply Co., Ltd., has given notice of its intention to change-over the supply from 220-V d.c. to the standard a.c. pressures

Battle.—ELECTRICITY IN THE WEALD.—Although the surveyor to the Rural District Council stated that he saw no objection to a proposal of the Weald Electricity Supply Co., Ltd., to erect overhead lines through Etchingham, the Council decided to ask the company to lay underground mains to preserve the amenities of the district.

Bedford.—LOANS.—The Electricity Committee desires to borrow £1,000 for the purchase of motors to hire out and £10,000 for transformers.

Birmingham.—HOSPITAL INSTALLATION.—The Hospitals Committee is to install electricity at the Hollymoor Hospital at a cost of £3,930.

Bolton.—SUB-STATION.—The Electricity Committee is to proceed with the erection of a sub-station at the Lostock Hall Estate.

Burnley.—PROGRESS.—Consumers taking electricity on the "all-in" tariff increased in number by over 3,100 during 1934, bringing the total to nearly double that at the end of 1933. Consumers under this tariff who are taking advantage of the facility of paying for electrical appliances through slot meters increased in number to the extent of 182 per cent., and the value of fittings and appliances purchased in this way now exceeds £23,700.

SUPPLY TO CLIVIGER.—The Corporation is applying for an order to supply electricity to Cliviger.

Caernarvon.—CHARGES.—The Town Council has decided to support a resolution of the Wrexham Corporation that North Wales shall be supplied with electricity by the Central Electricity Board at the same price as that offered in North-West England.

LOANS.—Application is being made for sanction to loans of £1,500 for meters and £1,000 for hire-purchase appliances.

Cheltenham.—BULK SUPPLY.—The Electricity Committee reports having made arrangements with the Shropshire, Worcestershire & Staffs Power Co. for modified terms for bulk supply.

Coulsdon and Purley.—STREET-LIGHTING PLANS.—The Urban District Council has given notice to terminate the existing contract for public lighting with the Croydon Gas Co., and a complete scheme of lighting on the basis of the tenders of the County of London Electric Supply Co., Ltd., and the Croydon Gas Co. is to be prepared by the Public Lighting Committee.

Cumberland.—RURAL SUPPLY.—Several development schemes are projected by the South Cumberland Electricity Supply Co., Ltd., including an extension of the main transmission line to Silecroft and Kirksanton, near Millom, and a power line from Duddon Bridge to the Hill.

Dartford.—COUNCIL'S OPPOSITION.—A letter from the West Kent Electric Co., Ltd., applying to the Rural District Council for consent to the erection of h.v. overhead lines in the district evoked a suggestion by the chairman that overhead cables, radiating in the rural area, were gradually "sterilising" the district. It was decided to oppose the application and to press for a public inquiry into the matter.

Eastbourne.—STREET LIGHTING.—Consideration is being given by the Electricity Committee to the improvement of street lighting throughout the town, particularly along bus routes and at busy or dangerous corners. A number of experiments have been carried out with various types of lamps and fittings, and work will shortly be put in hand to increase the wattage of all lamps along bus routes; replace fourteen installations at important street corners by taller columns and modern fittings (probably with electric-discharge lamps); and other improvements. During the past few weeks about 250 lamps in forty-three roads have been equipped with new brackets and fittings, and other roads will be dealt with from time to time.

DISTRIBUTION.—Several large housing estates and extensions of the distribution system are now receiving consideration in and around Eastbourne. Three estates (about 2,000 houses and bungalows) are already in course of development, and two others of about 500 houses are about to be commenced. The larger estates are situated in the rural area, and in return for the mains being laid underground three builders have agreed to wire their properties for lighting, heating, cooking and water heating.

SHOWROOM DISPLAYS.—As a result of the special displays in the showroom during the Christmas season the attendances by the public were increased by 50 per cent. Several novelties were introduced in the way of working models and demonstrations, and "Santa Claus" was in attendance with a large Christmas tree, prettily decorated, to distribute souvenirs to people who had helped the Department in the way of publicity. Regular demonstrations of confectionery-making, &c., were given, including a lecture, which was extremely well attended.

INCREASED ASSESSMENT.—The assessment of the undertaking has been increased by £2,140, while the rateable value of the rural area has been assessed at an increased figure of £342.

Gillingham (Kent).—NEW TARIFF.—The Town Council has adopted a new tariff for house property attached to business premises. The fixed charge will be arrived at on a basis of 4s. per quarter per 100 W of lamps installed, plus ½d. per kWh if an electric cooker or water heater is installed.

Gloucester.—HOUSE-WIRING INSTALLATIONS.—The City Council has approved the installation of electric light in all the houses to be erected on the Tredworth (174 houses) and Chequers Bridge (114) sites, with provision for points for cookers, wash-boilers and radiators.

Grampian Scheme.—THIRD STAGE.—Camps to accommodate 180 workmen are now practically complete at two ends of the tunnel, five miles long, which is to be constructed to bring the water of Loch Garry to Loch Ericht (border of Perthshire and Inverness-shire). The work, which is expected to take from three to three and a half years, represents the third stage of the Grampian hydro-electric power scheme, and the approximate cost is estimated at £250,000. The tunnel will penetrate Ben Udlaman, Perthshire. Boring operations on the 9 ft. diameter tunnel will commence shortly.—*Financial Times.*

Gravesend.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Rosherville Estate at a cost of £600.

Guildford.—ELECTRICITY SUPPLIES.—The Rural District Council has agreed to a suggestion of the Haslemere Urban District Council to form a committee of representatives of local authorities to consider electricity supplies and charges in the district.

Harrow.—COUNCIL HOUSE INSTALLATIONS.—The Housing Committee has approved the principle of council house tenants installing electricity provided there is no cost to the Council.

Havant.—PUBLIC LIGHTING.—The Urban District Council is to carry out street-lighting improvements.

High Wycombe.—CHEAPER ELECTRICITY.—As a result of an agreement between the Town Council and the Wycombe (Borough) Electric Light & Power Co. whereby the latter will be allowed to take 10¼ per cent., instead of 12½ per cent., from the gross profits of the electricity undertaking, various reductions in charges came into operation on January 1st.

Ilford.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to borrow £20,000 for mains and services and £5,000 for consumers' wiring installations.

India.—ELECTRICITY AT PALNI.—An electricity supply was inaugurated last month at Palni, a famous pilgrim centre in the Madura district.

Irish Free State.—FURTHER SHANNON DEVELOPMENTS.—The proposals to increase water storage in the Shannon (referred to in the annual report of the Electricity Supply Board) are to be proceeded with irrespective of any developments recommended in connection with the Liffey. According to the *Irish Independent*, the level of Lough Allen is to be raised by 5 ft., and water may be drawn from it until the level falls 9 ft. below the present summer basis. This will make

available three times the quantity of water now supplied by the lake to the Shannon. The cost of the work (which will take about two years to complete) is estimated at £150,000, of which £42,000 is being provided by the Government as a free grant. Plans for the embankment of Lough Derg and Lough Rea are also under consideration. The total expenditure on the Lough Allen and Lough Derg sections is expected to be about £500,000.

Kettering.—VILLAGE SUPPLIES.—The Rural District Council has given permission to the Electricity Department to erect overhead cables at Weekley and Barton Seagrave.

Leicester.—ELECTRIC COOKERS.—The City electrical engineer and manager (Mr. John Mould) informs us that the number of electric cookers on hire has now reached 10,000.

Liverpool.—TARIFF ALTERATION.—An alteration has been made to scale 5 (section A) of the electricity tariff. It is provided that for business premises which include retail shops, hotels, offices, &c., combined with private houses, there shall be a fixed annual charge of £12, instead of £14, per kW, based on the total wattage of the lamps installed (minimum of 300 W), payable in four equal quarterly instalments, plus ½d. per kWh up to 20,000 kWh per quarter and 0.4d. per kWh in excess of 20,000 kWh.

London.—EAST HAM.—In furtherance of the campaign to develop the use of electric vehicles for local delivery by tradespeople the following tariff for charging the batteries of such vehicles has been recommended: Rate A (unrestricted), 1d. per kWh; Rate B (for supply outside the peak hours), ¾d. per kWh.

Cookery demonstrations may be held at the Manor Park and Nelson Street Showrooms if a report which the borough electrical engineer has been asked to prepare is favourable.

Maidenhead.—HOUSE INSTALLATIONS.—The electrical engineer has prepared a scheme for the electrical equipment of eighty-six houses erected under the assisted scheme.

Maidstone.—MAINS EXTENSIONS.—The Town Council is to extend the mains to supply from forty to forty-five houses on the Sandway Estate, at Bearsted, and to houses at East Malling and elsewhere.

Maldens and Coombe.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £3,300 for improving the lighting of Malden Road, Coombe Road, Burlington Road and Kingston Road by electricity.

Manchester.—LOAN.—Sanction has been obtained to the borrowing of £250,000 for mains.

Midhurst.—EXTENSION.—Having been informed that the Mid-Southern Utility Co., Ltd., intends to apply for power to erect a l.v. overhead line from Midhurst to West Lavington and Cocking, the Rural District Council is suggesting to the company that the cable should be placed underground.

Ormskirk.—POPULARISING ELECTRIC COOKING.—A new scheme, called the "combined electric cooker and cheap electricity plan," has been introduced by the Ormskirk Electric Supply Co., Ltd. By this consumers are supplied with an electric cooker of the latest type, suitable for a family of four to six people. This is installed in the home, wired up ready to cook, and electricity is supplied for cooking up to 300 kWh at an inclusive charge of 25s. per quarter. If more than 300 kWh is used the additional energy is charged for at ½d. per kWh. A high-speed kettle, holding two pints of water, and a good-quality aluminium pan are included in the equipment.

Plymouth.—ENCOURAGING SHOP-WINDOW LIGHTING.—The Electricity Committee has decided to considerably reduce the rentals for meters and time switches for shop-window lighting after closing hours. The new rates are: 3s. per quarter for smaller premises and 6s. for larger.

CABLE EXTENSIONS.—Mains extensions in thirteen Plymouth, Stonehouse and Devonport streets have been authorised by the Electricity Committee. The three most important extensions are Seymour Avenue, Plymouth; Austin Avenue, Plymouth; and Cumberland Street, Devonport, costing £626, £324 and £309 respectively.

Portishead.—SITE FOR SUB-STATION.—The North Somerset Electric Supply Co., Ltd., has purchased a site at Beach Road from the Bristol Corporation for the erection of a the erection of a sub-station.

Portsmouth.—TRANSFORMER EXPLODES.—The breakdown of the insulation and the consequent ignition of the oil surrounding it are believed to have been responsible for an explosion of one of the two transformers at the Central Electricity Board's sub-station at the corner of Crown Street and Gunwharf Road on Wednesday last week.

Rawtenstall.—SUB-STATION.—The Electricity Committee has instructed the borough electrical engineer to prepare a scheme for the erection of a sub-station at Dean Lane.

Saxilby.—STREET LIGHTING INAUGURATED.—The village's electric street-lighting system was inaugurated on Christmas Eve by Councillor C. F. Shaw, chairman of the Council.

Sherrards Green.—AMENDED SCHEME.—It was recently decided by the Shropshire, Worcestershire & Staffs Electric Power Co. to lay an underground l.v. line at Sherrards Green, but this has been found impracticable, and the company has now obtained the consent of the Malvern Urban District Council to erecting overhead lines, it being pointed out that the proposed pole positions with overhead-line conductors would be situated at the rear of property.

South Africa.—CAPE TOWN PROPOSAL.—Included in the Cape Town municipal loan programme for the next three years is expenditure on electricity works to the total of £435,000.

JOHANNESBURG.—A report states that extensions are proposed at the Johannesburg municipal power station at a cost of £144,000. These comprise a 15,000-kW turbo-generator and a boiler and cooling towers. Under the scheme drawn up in 1932 it was considered that this additional plant would not be required until 1942.

South Shields.—LOAN.—The Electricity Committee is to seek sanction to borrow another £10,000 for services.

ELECTRIC WASHING.—Simplex electric wash-boilers are being installed at 148 houses on the Wenlock Road housing site.

Swansea.—A ROSY OUTLOOK.—In a review of the Electricity Department's activities the electrical engineer (Mr. J. W. Burr, M.I.E.E.) asserts that the future is especially rosy. During the past year, he declares, electrical developments have been phenomenal, the energy generated having increased by over 23,000,000 kWh, and the sale by practically 50 per cent. He adds that, through the combined efforts of the Corporation and the British Electrical Development Association the townspeople are being taught to think and live electrically, and anticipates that the rate of increase in consumption at Swansea will be more than maintained in the future. The great event of 1935 will be the opening of the Sir John North power station, the installation of the plant being almost completed. He finds it difficult to say authoritatively what the actual cost will be, but points out that there exist all the factors conducive towards a very low cost of generation.

Tenterden.—OVERHEAD LINES.—The Rural District Council has approved the erection of an overhead line from Tenterden to Woodchurch by the Weald of Kent Electricity Supply Co., Ltd.

Thedwastre.—SUPPLY TO COTTAGES.—The Rural District Council has consented to the East Anglian Electric Supply Co., Ltd., installing electricity at cottages to be erected by the Council at Elmswell, Walsham, and Woolpit while they are being built. The Council will pay the company three guineas in respect of each house. Switches and lamp holders are not to be fitted until application is made by the tenants.

The dress materials gallery at the Royal Acadamy Exhibition of British Art in Industry (January to March); the illumination is arranged so as to show the effect of soft concealed lighting on the materials. (See "Art in Industry," p. 64.)

Wakefield.—METERING EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £5,000 for metering equipment.

West Hartlepool.—STREET LIGHTING.—Some time ago the Corporation decided to improve the lighting of the main streets. A number of trial units were erected, and, after tests, Holophane "Duo-Dome" refractors were specified. In Church Street, an important thoroughfare, 500-W units are mounted on 20-ft. poles at 100-ft. spacings. The installation was carried out under the supervision of Mr. S. Tillotson, electrical engineer.

Wigan.—EXPENDITURE ON MAINS.—The electrical engineer estimates that £25,000 will be required for mains during the next three years, and application is to be made for sanction to a loan of this amount.

Wimbledon.—NEW WORKS.—The Electricity Committee has obtained sanction to borrow £30,000 for mains and house services and £3,000 for sub-stations.

DIESEL GENERATOR.—The Electricity Committee is seeking sanction to borrow £2,453 for the installation at the works of a 200-kW Diesel generator, together with the requisite switchgear.

SUB-STATIONS.—Work on the erection of sub-stations at the Coombe House Estate, Coombe, and the Parkfield Estate, New Malden, is to be proceeded with.

Traction

Argentina.—BUENOS AIRES UNDERGROUND.—The system which, as announced in our issue of December 14th, was closed by the Municipality less than a month after it had been opened on account of derailments and supply failures, was later re-opened, there being a temporary speed restriction of 12 m.p.h. and check rails were provided on the sharpest curves. The *Railway Gazette* states that officials of the Compañia Hispano Americano de Obras Públicas y Finanzas are reported to attribute the mishaps to acts of sabotage but that as the Anglo-Argentine and Lacroze Underground systems are working quite normally it is difficult to understand why the new Spanish line should be singled out for malicious damage in this way. This section is said to be characterised by a number of sharp curves and steep gradients.

Belgium.—ELECTRIC EXPRESSES.—The general plans for the running of electric express trains between Brussels and Antwerp have now been drawn up by the Belgian State Railway authorities. It is expected that the work of electrifying the line will be completed in time to allow the electric train service to be inaugurated on April 23rd next, a few days before the opening of the International Exhibition which is to be held in Brussels.

Bolton.—HORWICH TRAMS.—When the question of substituting buses for trams on the Horwich route was discussed by Bolton Town Council, Councillor Bradley stated that the Transport Committee felt it would be unwise at present to adopt a trolley-bus system, which would require fixing four extra overhead wires round the town centre to serve only one route. The time to decide on a general future transport policy would be five years hence. Councillor Booth thought it would be better to spend £19,000 on renewing the tram track than £31,000 on buses. The recommendation to substitute buses for trams was referred back for further consideration.

Chesham.—RAILWAY ELECTRIFICATION.—The Urban District Council is considering sending a deputation to the Ministry of Transport urging that the Chalfont and Latimer to Chesham branch railway line shall be electrified. It is operated by London Transport (Metropolitan Line).

Egypt.—HELOUAN LINE TO BE ELECTRIFIED.—According to the *Railway Gazette*, the budget for the year 1934-1935 contains an item of £E10,000 as first instalment of the funds necessary for the electrification of the Helouan line of the State Railways. The Railway Board recently decided to proceed with the work, and a committee was formed to formulate the scheme.

Germany.—RAILWAY ELECTRIFICATION.—The Halle district branch of the State Railways has introduced electric traction on the section between Halle and Stussdorf, which forms part of the electrically operated line between Halle and Keethen. Locomotives are used instead of motor coaches, and the speed is stated to reach 93 miles an hour. Up to the present the State Railways have generated their own electricity, but with the extension of electrification they have been compelled to have recourse to private power companies. This will involve the erection of transformer stations, and work on one of these stations, we are informed by *Reuter's Trade Service*, has already been put in hand at Pforzheim; this will hasten the electrification of the Baden railways. It is expected that the Pforzheim transforming station will be in operation in the winter of 1935 and will supply the Stuttgart-Karlsruhe and Mühlacker-Bruchsal lines, which are now being electrified. A section of the Dreisee line (Titisee-Seebrugg) will be opened to traffic with four locomotives in the summer.

Liverpool.—NEW TRAMCARS.—Borrowing powers for £150,000 have been obtained by the Liverpool Corporation Passenger Transport Department in respect of the cost of sixty-eight new tramcars. The City Council is also considering the question of constructing a new tramline from Mill Street to Dingle Lane at a cost of £20,405.

London.—MORE ESCALATORS.—According to the programme of the London Passenger Transport Board there will be 137 escalators working at Underground stations by the spring of this year. There are now in operation about twenty of the type originally introduced, which have a maximum speed of 90 ft. per minute. These necessitate a side step-off. The more modern escalators have a forward step-off and run faster than those of the old type. The fastest escalators on the underground system move at 160 ft. a minute and they are capable of a speed of 180 ft. per minute. Other modern types in use have a maximum speed of 100 ft. a minute. Lifts will continue in use for the conveyance of passengers at a number of stations.

South Africa.—DURBAN.—Eleven British-made trolley-buses have been purchased to replace trams on the municipal routes.

Southern Railway.—WATERLOO STATION SCHEME.—The Southern Railway Co. has announced its intention to proceed with improvements, costing £500,000 in the lines around Waterloo Station, London. At present the station is used to its full capacity, and owing to the "bottle-neck" between Vauxhall and Waterloo a complicated system of cross-over roads has to be used. A "fly-over" bridge is to be constructed at Durnsford Road, Wimbledon, which will enable a transposition of lines to be made between Wimbledon and Waterloo, allowing the provision of more trains at peak hours. Three-colour light signalling is to be introduced on the Hampton Court line, and a manually operated signal box at Waterloo is to be converted to electric working.

The entrance to Waterloo station

Southport.—TRAMS.—On January 1st the whole of the town's transport services were transferred from trams to buses.

South Shields.—LOAN.—The Transport Committee has obtained sanction to borrow £4,000 for the tramway section of the scheme for the reconstruction of Ocean Road, South Shields.

York.—TRAMS.—The tram service between Dringhouses and York ceased to operate on January 5th, and buses have been substituted.

Communications

Canada.—MARINE RADIO.—A *Reuter* message from Montreal states that a move is being made in Canada to promote an alteration of international law so that all seagoing vessels shall be compelled to carry wireless. The original proposal that Canada should take the initiative in this matter was made by the Premier of New Brunswick, Mr. L. P. D. Tilley. Now Mr. A. Duranleau, Minister of Marine, has announced that he intends to put this proposal before the Dominion Government.

Essex.—SCHOOL RADIO.—At senior schools where the County Education Committee is satisfied that wireless lessons would form a useful part of the curriculum the Committee is to supply and maintain receiving sets. Up to the present the Committee has not accepted any responsibility for the cost and maintenance of the sets.

France.—EIFFEL TOWER.—It has been decided to operate the Eiffel Tower broadcasting station on a medium wave length in accordance with the Lucerne agreement.

Germany.—RADIO LICENCES.—There are now 5,911,330 radio licences issued, which is 9 per cent. of the population, as compared with 13 per cent. in Great Britain.

Hungary.—NEW RADIO STATION.—Budapest II is now operating experimentally on a wavelength of 834.5 metres, with a power of 20 kW.

India.—TELEPHONY.—The Shillong-Gauhati telephone trunk line which is already in operation will be extended to Calcutta by March next.

Irish Free State.—RURAL TELEPHONE EXCHANGES.—The Postal Authorities have at present under consideration a scheme for the establishment of a rural automatic exchange as an experiment to test the practicability of adopting such a system generally. The chief engineer of the I.F.S. Post Office has expressed the opinion that the future of the telephone system lies in the development of automatic exchanges in rural areas.

Latvia.—NEW RADIO STATION.—According to the *Wireless World*, the new transmitter at Goldingen is now testing with an aerial output of 20 kW on a wavelength of 238.5 metres. The power is to be increased to 50 kW in the spring.

Northants.—RADIO FOR THE BLIND.—Blind people in Wellingborough and Irthlingborough are to be provided with free wireless facilities by the broadcast relay services operating in the two towns, and a collection is being made to provide the necessary loud speakers. At Kettering all blind people have received free service since the inauguration of the Radiomains service in 1933.

Poland.—"NATIONAL" RADIO SET.—In conjunction with the Polish Ministry of Posts, the Polish Electrotechnical Association has had a "National" receiver built at the State Institute for radio telephony. It is expected that this type will find a large sale, as with the "Volksempfänger" in Germany. The receiver is equipped with two valves and loud speaker, and is to be produced by all Polish radio works and sold at a uniform price of 140 zlotys (about £3 10s.).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdare.—January 23rd. Electricity Department. One single-bulb rectifier equipment.—(See this issue.)

Army Contracts.—Manufacturers who are not on the War Office list of tenderers and wish to be invited to tender for general stores should apply to the Director of Army Contracts, Caxton House (West), Tothill Street, S.W.1. (January 4th.)

Australia.—BRISBANE.—April 2nd. City Electric Light Co. 11,000-V and 415-V metal-clad switchgear. (A.Y. 12841.)*

MELBOURNE.—Posts and Telegraphs Department. February 5th. Outside distributing wide. (A.Y. 12830.)*

February 19th. Magnets and automatic telephone hand-sets and accessories. (A.Y. 12829.)* Jumper and other insulated wire. (A.Y. 12831.)*

March 5th. Submarine telegraph cable (shore-end type). (A.Y. 12861.)*

Barking.—January 28th. Town Council. Electrical installation at extension to Upney Lane hospital. Particulars from H. H. Dawson and H. W. Allardyce, Clock House Chambers (deposit £2 2s.).

Beckenham.—January 28th. U.D.C. L.p. paper-insulated cables. (December 28th.)

Belfast.—January 18th. Electricity Department. Materials for one year commencing April 1st. (January 4th.)

January 18th. Town Council. Electrical work for assisted wiring scheme. Particulars from the city electrical engineer (deposit £2 2s.).

Bexley.—January 26th. U.D.C. Street-lighting equipment. (December 21st.)

Beckenham.—January 28th. U.D.C. L.p. paper-insulated batteries for electric vehicles. (December 21st.)

Burton-on-Trent.—January 30th. Corporation. Supply and laying e.h.p. and l.p. cable, and supply and erection of e.h.p. and l.p. switchgear and two 250-kVA transformers. (See this issue.)

Caithness.—January 25th. County Council. Various works, including electrical, at new elementary school, Wick. Schedules, &c., from S. MacDonald & Son, architects, Wick and Thurso (deposit £2 2s.); tenders to D. W. Georgeson, clerk to the Education Committee, Wick.

Carlisle.—January 25th. Electricity Department. Stoneware conduits and hard-burned cable covers. (See this issue.)

Cheadle & Gatley.—January 17th. Electricity Department. One 250-kVA 6.6-kV transformer switch and distribution kiosk sub-station. (January 4th.)

Cleethorpes.—January 25th. U.D.C. Electric lift and motor for electricity showrooms. Particulars from the U.D.C. engineer.

Dewsbury.—January 15th. Wiring of houses at Dawgreen (sixty-four), Lees Moor (208), Heaton Lodge (108). Particulars from borough electrical engineer, Bradford Road; tenders to Holland Booth, town clerk, Town Hall.

Dumfries.—January 15th. Town Council. Various works, including electric lighting at the Nithside housing scheme (ninety-six houses). Specifications and forms from R. S. Osborne, burgh surveyor; tenders to town clerk.

Dunfermline.—January 21st. Town Council. Various works, including electric lighting, at Bellycoman housing scheme (ninety-two houses). Schedules, &c., from D. H. Shaw, burgh engineer, City Chambers (deposit £1 1s.); tenders to town clerk.

Eastbourne.—January 29th. Electricity Department. General stores for year commencing April 1st, 1935. (See this issue.)

Egypt.—CAIRO.—Ministry of Public Works. March 5th. Overhead transmission lines for the North Delta electricity scheme. (A.Y. 12860.)*

Epsom and Ewell.—January 14th. Electricity Department. L.p. cable. (January 4th.)

Farnborough.—January 19th. U.D.C. Lighting for approximately 4½ miles of main roads. (December 28th.)

Hamilton.—Electricity Department. Cables, cut-outs, sealing chambers, service boxes, transformers, &c. (See this issue.)

Hastings.—January 31st. Electricity Department. Copper wire, &c., for the year ending March 31st, 1936. (December 28th.) Electrical materials for the year ending March 31st, 1936. (December 7th.)

Hull.—January 15th. Electricity Department. Stores and haulage for twelve months from April 1st. (January 4th.)

Ilford.—January 18th. Electricity Department. 500-kVA outdoor transformer. (December 28th.)

Irish Free State.—DUBLIN.—January 31st. Electricity Supply Board. One 20,000-kW turbo-alternator and exciter, complete with condensing and auxiliary plant. (December 14th.)

Kingston-upon-Thames.—February 7th. Corporation. Street lighting equipment, with electric discharge lamps. (January 4th.)

Liverpool.—January 23rd. Corporation. Materials for the year ending March 31st, 1936. (January 4th.)

London.—CAMBERWELL.—January 14th. Borough Council. Twelve months' contracts for various items including the maintenance of electric lighting, heating and power installations, electric clocks, &c., and the supply of electric lamps. Forms of tender, &c., from borough engineer and surveyor, Town Hall.

ISLINGTON.—January 16th. Borough Council. Electrical and engineers' stores for one year commencing April 1st, 1935. (December 14th.)

POPLAR.—January 16th. Borough Council. D.c. three-wire switchboard. (December 21st.)

HAMMERSMITH.—January 23rd. Borough Council. Stores and materials for twelve months from April 1st, 1935. (See this issue.)

Manchester.—January 14th. Electricity Department. Two neutral earthing resistances for Stuart Street power station and two transformer oil purification equipments for High Street depôt, Chorlton-on-Medlock. (January 4th.)

New Zealand.—CHRISTCHURCH.—Drainage Board. April 5th. Three electrically driven sewage pumping sets, with starters, pipes, valves, &c. (G.Y. 14505.)* Five panels of switchgear for supply to a pumping station. (A.Y. 12795.)*

WELLINGTON.—Posts and Telegraphs Department. February 4th. Insulated and braided bronze wire. (A.Y. 12844.)*

February 12th. Biasing springs, bridging coils, keys, jacks, &c. (A.Y. 12847.)*

February 13th. Power relays. (A.Y. 12780.)*

February 14th. 15,000-ft. of switchboard cables. (A.Y. 12842.)*

February 20th. Insulated, impregnated and l.c. telephone cable. (A.Y. 12828.)*

February 21st. Flameproof jumper wire. (A.Y. 12832.)* V.i.r. wire. (A.Y. 12843.)*

February 25th. Enamelled copper wire. (A.Y. 12804.)*

February 26th. 5,100 galvanised earth rods. (A.Y. 12835.)*

February 28th. Switchboard cables. (A.Y. 12837.)*

March 4th. 50,000 P.O. type large insulators. (A.Y. 12856.)*

Public Works Department. February 19th. 50-kV outdoor switchgear, including steelwork, for Henderson sub-station. (A.Y. 12758.)*

March 5th. Seven 8,000-kVA transformers. (A.Y. 12757.)*

Nottinghamshire.—County Council. Contractors wishing to tender for electric lighting works required by the Council during 1935-1936 are asked to communicate with K. Tweedale Meaby, clerk to the Council, Shire Hall, Nottingham.

Oxford.—February 1st. Electricity Supply Department. Cables, transformers, electrically propelled tower wagon and delivery van. (See this issue.)

Porthcawl.—January 14th. U.D.C. Three sets of electrically driven centrifugal sewage pumps. Particulars from J. Taylor & Sons, engineers, Caxton House, Westminster, S.W.1.

Plymouth.—February 2nd. Corporation. Meters, time switches, cables, transformers and e.h.p. and l.p. switchgear. (See this issue.)

Seaford.—January 30th. U.D.C. Automatic electric sewage pumps, with motors, starting equipment, &c. Particulars from the Council's surveyor, Council Offices.

South Africa.—JOHANNESBURG.—January 29th. Electricity Supply Commission. Steam-raising plant, steam turbine-driven alternators, and three feed pumps and feed heaters and surge tanks. (G.Y. 14522.)*

PRETORIA.—Union Tender & Supplies Board. February 1st. Time-check apparatus for Kroonstad and Pretoria telephone exchanges. (A.Y. 12857.)* Star quad and multiple twin telephone cables. (A.Y. 12858.)*

February 8th. L.c., v.i.r. single conductor cables. (A.Y. 12866.)*

CAPE TOWN.—Electricity Department. February 6th. L.c. cable. (A.Y. 12865.)*

Southend-on-Sea.—February 7th. Electricity Department. General stores for the year commencing April 1st next. (See this issue.)

Torquay.—February 4th. Corporation. Twelve months' supply of electric lamps. Particulars from the borough engineer.

Uruguay.—MONTEVIDEO.—State Electricity Supply and Telephones Administration. February 4th. Porcelain insulators, fuses, &c. (A.Y. 12813.)*

February 11th. Automatic time switches. (A.Y. 12862.)*

March 4th. 45,000 aerial fuses and 65,000 fuse plugs. (A.Y. 12815.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bradford.—Tramways Committee. Accepted. Fifteen double-deck railless electric trolley passenger vehicles (£30,881).—English Electric Co., Ltd.

Cheltenham.—Baths Committee. Accepted. Electrical installation at swimming pool (£105).—R. E. & C. Marshall.

Heston and Isleworth.—Corporation. Accepted. Three switches, complete with duplicate busbar (£1,527).—A. Reyrolle & Co., Ltd. Three transformer kiosks (£2,766).—Crompton Parkinson, Ltd. Underground distribution network boxes.—G. P. Cosway, Ltd. Two 300-kVA transformers (£722).—Hackbridge Electric Construction Co., Ltd.

Hull.—Telephones Committee. Accepted. Cable (£226).—British Insulated Cables, Ltd. Switchboards (£182).—Ericsson Telephones, Ltd.

Electricity Committee. Accepted. Electric telpher (£478).—Vaughan Crane Co., Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—Telegraph Construction and Maintenance Co., Ltd. (£985); W. T. Henley's Telegraph Works Co., Ltd. (£406); Edison Swan Cables, Ltd. (£435); Metropolitan Electric Cable and Construction Co., Ltd. (£200).

Transport Committee. Accepted. Trolley wire and bolts (£544).—British Insulated Cables, Ltd.

London.—EAST HAM.—Electricity Committee. Accepted. 500-kVA transformer (£231).—English Electric Co., Ltd.

Manchester.—Housing Committee. Accepted. Electrical installation at 138 houses on various estates.—H. C. Taylor & Co.

Health Committee. Accepted. Automatic fire alarm system at Baguley sanatorium.—Era Time & Telephone Systems, Ltd. Electric truck.—Greenwood & Batley, Ltd.

Education Committee. Accepted. Electrical work at Johnson Street and Varna Street schools.—J. Collier & Co., Ltd.

Electricity Committee. Accepted. 33,000-V cable replacement. —Callender's Cable & Construction Co., Ltd. Contracts for twelve months: A.c. electric fan motors.—Lancashire Dynamo & Crypto, Ltd. L.v. sub-station switchgear.—Parmiter, Hope & Sugden, Ltd. Circulating-water pumps and motors at Stuart Street station.—Mather & Platt, Ltd. Boiler flue cleaning equipment at Barton station.—British Vacuum Cleaner & Engineering Co., Ltd. Street lanterns for electric discharge lamps. —General Electric Co., Ltd.; Wardle Engineering Co., Ltd.; British Thomson-Houston Co., Ltd.

Northampton.—Housing Committee. Accepted. Electric lighting installations in 1,050 Council houses (£3,437).—Hutchings & Cunnington.

Salford.—Health Committee. Recommended. Telephone installation at Hope Hospital (£325).—Reliance Telephone Co., Ltd.

South Cambridgeshire.—R.D.C. Accepted. Electrically driven machinery for Linton water supply scheme (£1,450).—W. H. Allen, Sons & Co., Ltd.

Sutton Coldfield.—Electricity Committee. Accepted. Switchgear (£219).—Switchgear & Cowans, Ltd.

West Calder.—County Council. Accepted. Electrical work at 104 houses (£674).—Grant & Reid.

Forthcoming Events

Bristol Electric Club.—Friday, January 11th. Royal Hotel, Bristol. 8.15 p.m. Address by Mr. A. H. Russell. "Methods of Lightning Calculation."

Institution of Mechanical Engineers.—Friday, January 11th. Institution, London. 7 p.m. Informal meeting. "Automatic Railway Signalling."

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, January 12th. South Wales Institute of Engineers, Cardiff. 5.30 p.m. Joint meeting with the National Association of Colliery Managers. "Recent Developments in Electrical Equipment for Mines." Mr. S. W. Richards. Saturday, January 19th. 6 p.m. Two cinematograph films on Reyrolle switchgear and Ferranti surge absorbers.

Institution of Electrical Engineers.—Monday, January 14th. Institution, London, 7 p.m. Informal meeting. Discussion on "Economics of Electric Cooking." To be opened by Mr. W. N. C. Clinch. Thursday, January 17th. 6 p.m. Joint meeting with the Institute of Fuel. "The Removal of Smoke and Acid Constituents from Flue Gases by a Non-effluent Water Process." Messrs. J. L. Pearson, G. Nonhebel, and P. H. N. Ulander. (*North-Eastern Students' Section*).—Friday, January 11th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Recent Developments in Illumination." Mr. N. H. Denholm. Saturday, January 19th. 2.30 p.m. Visit to the works of the Bushing Co., Hebburn-on-Tyne. (*North-Eastern Centre*).—Monday, January 14th. Armstrong College, Newcastle-on-Tyne. 7 p.m. Address by Prof. W. M. Thornton. "Insulation." (*South Midland Centre*).—Monday, January 14th. James Watt Memorial Institute, Birmingham. 7 p.m. "Electrical Warming and Air Conditioning of the Larger Buildings." Messrs. R. Grierson and D. Betts. (*East Midland Sub-Centre*).—Tuesday, January 15th. University College, Nottingham. 6.45 p.m. "Electrical Developments in the U.S.S.R." Mr. A. Monkhouse. (*Mersey and North Wales (Liverpool) Students' Section*).—Tuesday, January 15th. The University, Liverpool. 7.30 p.m. Subject to be announced later. (*North Midland Students' Section*).—Tuesday, January 15th. Hotel Metropole, Leeds. 7.15 p.m. "The Electric Organ." Mr. C. C. Postill. (*North-Western Students' Section*).—Tuesday, January 15th. Engineers' Club, Manchester. 7.15 p.m. "Modern Street Lighting." Mr. C. C. Paterson. (*Scottish Students' Section*).—Tuesday, January 15th. Heriot Watt College, Edinburgh. 7.15 p.m. Short papers. Thursday, January 17th. Royal Technical College, Glasgow. 7.30 p.m. Debate. (*Sheffield Sub-Centre*).—Wednesday, January 16th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*Western Centre*).—Wednesday, January 16th. Merchant Venturers' Technical College, Bristol. 7 p.m. Joint meeting with the Western Branch of the Institution of Mechanical Engineers. "Works Power Services." Mr. H. C. S. Widlake. (*Irish Centre (Dublin)*).—Thursday, January 17th. Trinity College, Dublin. 6 p.m. "Some Aspects of the Shannon Scheme Protection." Mr. J. J. O'Doherty.

Institution of Welding Engineers (*North-Eastern Branch*). —Monday, January 14th. Cleveland Scientific and Technical Institute, Middlesbrough. 7.30 p.m. "Some Observations upon the Use of Arc Welding for Shipbuilding and Repairing." Mr. H. W. Townshend. Tuesday, January 15th. Institution of Mining and Mechanical Engineers, Newcastle-on-Tyne. 7.15 p.m. Mr. H. W. Townshend's paper.

Institution of Civil Engineers.—Monday, January 14th. Institution, London. 6 p.m. Discussion on "The Perak River Hydro-electric Power Scheme," papers by Messrs. B. M. Hellstrom and W. J. H. Rennie. Wednesday, January 16th. 6 p.m. Discussion on "Providing a Cheap Supply of Electricity to Country Consumers," paper by Mr. F. W. Shilstone.

Association of Supervising Electrical Engineers.—Tuesday, January 15th. E.L.M.A. Lighting Service Bureau, W.C.2. 7.15 p.m. "The Technical Expert in the Witness Box." Mr. A. Murray Coombs.

Royal Institution.—Tuesday, January 15th. Institution, W.1. 5.15 p.m. "Electron Diffraction and Its Applications." Prof. G. P. Thomson.

Electrodepositors' Technical Society.—Wednesday, January 16th. Northampton Polytechnic Institute, E.C.1. 8.15 p.m. "Suspension Methods in Electrodeposition Practice." Mr. C. F. J. Carter.

Electrical Power Engineers' Association (*Manchester Section*).—Saturday, January 19th. Victoria Hotel, Manchester. 6 for 6.30 p.m. Annual dinner and dance.

Notes

Sequel to a Scottish Supply Failure

The failure of the electricity supply in Dalbeattie, Kirkcudbrightshire, on January 31st, 1934, which has been the subject of prolonged discussion at meetings of the Stewartry County Council and Dalbeattie Town Council, has been followed by the arrest of three of the officials of the County Council Electricity Department. They were charged on indictment with having on January 31st, 1934, at the electric power station, Dalbeattie, unlawfully and maliciously severed an electric line supplying the central district of Dalbeattie with electric light and power, with intent to cut off the supply of electricity to the district, and deprived about four hundred consumers of the use of electricity.

Following the failure of the supply the Town Council pressed the County Council to hold an inquiry, the allegation being made that the wires had been cut deliberately. The County Council Electricity Committee appointed a sub-committee to conduct an inquiry. This sub-committee reported that it had examined witnesses and had received a report on the damaged cable by a firm of consulting electrical engineers. The sub-committee felt that owing to the conflicting nature of the evidence available it was not possible to arrive at a definite conclusion, and that this was partly attributable to its not being in a position to examine the witnesses on oath. The sub-committee recommended the Committee to consider the advisability of handing the matter over to the Procurator-Fiscal for investigation. The Electricity Committee, however, decided that no good purpose could be served by continuing the investigation. The decision was not well received in Dalbeattie, and the Town Council was considering further action when the matter was placed in the hands of the Procurator-Fiscal through another source.

The three officials concerned, Norman Turner Smith, Geoffrey Victor Vaughan and Alexander Dobie, appeared before the Sheriff-Substitute at Dumfries on January 3rd. The proceedings were formal, and the accused were committed for trial, bail being allowed.

I.E.E. National Certificates

National Certificates and Diplomas in electrical engineering awarded in England and Wales by the Institution of Electrical Engineers in conjunction with the Board of Education numbered 1,229 in 1934, which was an increase of 135 on the previous year.

Sulphur Elimination at Battersea

A further report on the treatment of chimney gases which escape from each chimney of the new Battersea power station of the London Power Co., Ltd., at the rate of twenty million cu. ft. per hr. has been issued by the committee presided over by the Government Chemist (Stationery Office, 1d.). The process consists essentially of a washing of the gases by water in the presence of metallic iron in the horizontal flues, followed by water sprays and a treatment with an alkaline liquor (most recently a suspension of chalk) in the vertical flues. The plant has been working for about eight months, and the quantity of sulphur escaping into the air as sulphurous anhydride is about 0.03 grain per cu. ft. The committee would raise no objection to the installation of three more boilers, but considers that any more recent technical developments should be incorporated. The thorough washing of the gases obviates the risk of deposition of solid matter from the chimneys. The Port of London Authority required that the quantity of suspended matter in the water passed back to the Thames, after being used for cooling and sulphur elimination, should not exceed the original figure by more than 14 grains in 100 gal. of deoxygenating matter (including sulphite). Dr. J. F. Beale, who surveys the river for the Authority, states that there is no appreciable increase in suspended matter, that the deoxygenating matter is well within the statutory limit, and that the water has not been rendered acid.

Engineers and Economics

A meeting of the Engineers' Study Group on Economics, which is expected to be of interest to engineers and scientific workers, will be held on Wednesday next, January 16th, at Denison House, 296, Vauxhall Bridge Road, S.W. Major C. R. Attlee, M.P., will give an address on "The Engineer and Technical Worker and the Socialist State." The chair will be taken by Major H. L. Nathan, M.P., and a discussion will follow. Tickets may be obtained from the hon. secretary, Mr. A. H. Hayes, Hazlitt House, Southampton Buildings, Chancery Lane, W.C.2.

Appointments Vacant

Technical assistant to the consumers' engineer for Salford City Electricity Department.

Junior assistant engineer for Newport (Mon.) Corporation. (See our classified advertisements.)

Makers' Names Wanted

ARKOGRAF engraving pencil.

WARD'S electric washer (Canadian).

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. Monkhouse, the author of the paper on "Electrical Developments in the U.S.S.R.," which was to be read before the Institution of Electrical Engineers in London yesterday (Thursday), is in an authoritative position to speak upon the subject having spent a considerable period in Moscow as the chief representative there of the Metropolitan-Vickers Electrical Co., Ltd. Our readers will recall that Mr. Monkhouse returned to this country in 1933 following charges brought against certain of the company's employés in Moscow which resulted in the notorious "Moscow trial." The photograph which accompanies this note was taken by us at an Institution of Electrical Engineers' Overseas Conversazione.

Mr. A. Monkhouse

Mr. H. W. Sutton, of Southend-on-Sea, district representative of the County of London Electric Supply Co., Ltd., who has retired, has been presented by his colleagues with an inscribed electric clock.

Mr. A. E. Hindle, charge engineer with the Manchester Corporation Electricity Department, has been presented with a wireless set by the staff and employés of the Department on his retirement after over thirty-one years' service.

Mr. Edward B. Meyer, who has been nominated as president of the American Institute of Electrical Engineers for 1935-36, was a vice-president from 1932 to 1934. According to the *Electrical World*, from which the accompanying portrait is reproduced, he has taken an active part in the affairs of the American Standards Association, the old National Electric Light Association, and various engineering and other societies. He is vice-president of United Engineers and Constructors, Inc., of Newark, N.J., with which the Public Service Production Company (of which he had been chief engineer since 1922) was merged in 1930. He is the author of numerous technical articles dealing with electrical transmission and distribution problems.

Mr. E. B. Meyer

Mr. A. S. Rinder has been appointed managing director of Messrs. Alfred Bird & Sons, Ltd., Birmingham, and has relinquished his duties as manager of the London District office of the Metropolitan-Vickers Electrical Co., Ltd. He remains a director of that company, however. **Mr. D. MacArthur,** manager of the Glasgow office of the Metropolitan-Vickers Electrical Co., succeeds Mr. Rinder as manager of the London District office, and took up his duties as from January 1st, 1935.

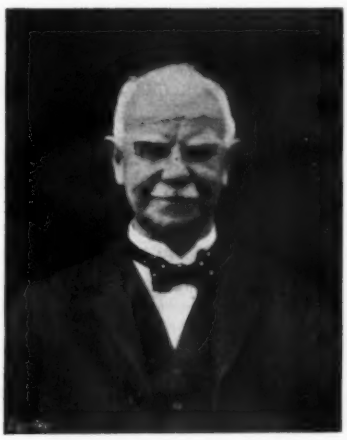
Mr. A. S. Rinder

Mr. C. H. Clarke, for several years patent agent for the English Electric Co., Ltd., has ceased to be a member of that company's staff and is practising on his own account, but he will continue to act for the company in certain important matters. His present address is 24, Hermon Hill, London, E.11.

Mr. Cecil G. Stanesby, after being secretary of the Charing Cross Electricity Supply Co., Ltd., for many years and serving the company in that and other capacities for thirty-eight years, retired at the end of December. Mr. Stanesby has not been in very good health for some time, but the many friends who have met him during his very lengthy service in connection with London's electricity supply will wish him fitness to enjoy the leisure of retirement.

Obituary

Sir J. A. Ewing.—The death occurred on Monday last of Sir James Alfred Ewing, K.C.B., F.R.S., M.Inst.C.E., &c. Born at Dundee in 1855, Sir Alfred was in his eightieth year. The photograph accompanying these notes was taken by the ELECTRICAL REVIEW between three and four years ago on the occasion of the centenary meeting of the British Association, held in London, when Sir Alfred presided over the Engineering Section and delivered its inaugural address on the subject of "Power." Sir Alfred was the son of the Rev. James Ewing, and after leaving the University of Edinburgh he was engaged in engineering work for some years, and later was, from 1878 to 1883, professor of mechanical engineering at the Imperial University at Tokyo. On his return home he was professor of engineering at Dundee University College for seven years, after which he held the professorship of mechanism and applied mechanics at Cambridge University from 1890 to 1903. For thirteen years thereafter he was Director of Naval Education. In 1895 he was awarded the Royal Medal for researches in magnetism. He contributed many papers on magnetism, the physics of metals and other subjects to the proceedings of the Royal Society and other bodies. Sir Alfred was twice married, his second wife being a daughter of the late Dr. John Hopkinson. He was made a C.B. in 1907, and was knighted in 1911.



The late Sir J. Alfred Ewing

At the outbreak of war Sir Alfred undertook the important task of dealing with enemy cipher messages for the Admiralty. The department, which ultimately kept a staff of fifty engaged collecting and deciphering wireless messages, was known as "Room 40," and rendered invaluable service. The funeral took place yesterday at Cambridge.

Mr. F. A. Bond.—We record with regret the death of Mr. Frederick Arthur Bond, chief electrical engineer to the Battersea Borough Council for twenty-eight years. He was found dead at his home, South Side, Streatham Common, on January 2nd, and at the inquest held on January 4th evidence was given to show that he was a very happy man, was very considerate to his staff, but had been worried about his health. The Town Clerk said that there was no difficulty, trouble, or friction with regard to his post. A doctor with whom Mr. Bond had played golf for twelve years described him as a wonderful personality. The Mayor of Battersea was present and in expressing sympathy said that Mr. Bond was a man of the highest integrity, was a painstaking public official, and the borough had lost a very distinguished and loyal servant. Mr. Bond, who had been a member of the Institution of Electrical Engineers since 1913, and was an associate member in 1902, was fifty-eight years of age. He was a native of Glamorgan and received his technical training at University College, Bristol. After serving an apprenticeship

The late Mr. F. A. Bond

at Bristol he spent two years with Messrs. Jolin & Co., manufacturers of electrical machinery and apparatus, and early in 1899 he joined the staff of the City of London Electric Lighting Co. at Bankside, where he remained as an assistant engineer for four years. He was chief assistant engineer with the Ilford Urban District Council from 1902 to 1904, and was chief of the Heston and Isleworth undertaking from 1904 to 1906. In the latter year he was appointed borough electrical engineer at Battersea. The capital expenditure on the undertaking was then £237,150; to-day it is £1,693,948. In addition to his I.E.E. membership, Mr. Bond was also a member of the Institution of Mechanical Engineers, the Central Electricity Board's Technical Advisory Committee for South-East and East England, and the Electric Vehicle Committee. He represented the I.M.E.A. on the Electric Fittings Statutory Committee and the British Engineering Standards Sub-Committee on Reciprocating Steam Engines. The funeral took place on Monday last. Mr. H. F. J. Thompson is acting borough electrical engineer.

Mr. R. Bilsland.—The death occurred on January 2nd, at Liverpool, of Mr. Robert Bilsland, B.Sc., late of the English Electric Co., Ltd.

Wills.—Professor J. G. Gray, D.Sc., M.I.E.E., F.R.S.E., Dowanhill, left £6,408. He has bequeathed to the Glasgow University his collection of gyroscopes and apparatus at the University or elsewhere to be used for demonstration purposes by or under the charge of the Professor of Applied Physics for the time being or anyone authorised by him.

Mr. D. Ellard Norton, late director of the Consolidated Signal Co., Ltd., and the Westinghouse Brake & Saxby Signal Co., Ltd., left £111,367, with net personalty £104,390.

Mr. J. A. Brodie, formerly Liverpool City Engineer, past president of the Institution of Civil Engineers, and for many years Associate Professor of Engineering in Liverpool University, left £14,165 (net personalty £10,362).

Mr. J. P. Forster, chief engineer of the Mining Department of the North-Eastern Electric Supply Co., Ltd., left £6,817, with net personalty of £3,665.

The late **Mr. A. B. Mountain,** retired electrical engineer, left £19,131 (net personalty £17,558).

Mr. A. Rashleigh Phipps, governing director of Messrs. Rashleigh Phipps & Co., left £14,263 (net personalty £13,943).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Ralph Garrett, Ltd.—Private company. Registered January 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical, electrical, and wireless engineers, &c. The permanent directors are: H. R. Garrett, 18, Ship Street, Brighton, and two others. Solicitors: H. Wilfred Aldrich, 56, Old Steine, Brighton, and Dacre House, Arundel Street, W.C.2.

Battery Maintenance, Ltd.—Private company. Registered January 4th. Capital, £3,000 in £1 shares. Objects: To acquire the businesses carried on by W. A. Bull, at 9, Newton Road, Torquay, as Battery Maintenance (Torquay), and at Sherborne Road, Newton Abbot, as Mid-Devon Electrical Repair Service, and to carry on the business of electrical, automobile, motor, mechanical and general engineers, &c. The first directors are: W. A. Bull, "Norwood," Huxmoor Cross, Kingskerswell, Devon, and three others. Secretary: H. A. T. Coles. Registered office: 9, Newton Road, Torquay, Devon.

Block Patents, Ltd.—Private company. Registered January 3rd. Capital, £220 in £1 shares. Objects: To acquire any patents, concessions and the like relating to the production, storage, distribution and use of electricity and of any apparatus therefor, &c., and to adopt an agreement with L. Fuller, G. J. A. Fuller, Edmund W. Sudlow, and Thos. W. Hayes. L. R. Shaw is a permanent director. Registered office: 4, Broad Street Place, E.C.2.

Holt's Radio Relay (Blackburn), Ltd.—Private company Registered December 31st. Capital, £1,000 in £1 shares. Objects: To construct and maintain wireless signal stations and all other stations; to carry on the business of consulting wireless experts, &c. The first directors are: R. E. Stephenson, Oaklands, Reedley Drive, Burnley; and J. R. Holt, 23, Claughton Street, Burnley. Registered office: 23, Claughton Street, Burnley.

Churchman's Electric & Radio Factors, Ltd.—Private company. Registered December 31st. Capital, £500 in £1 shares (400 6 per cent. cumulative preference and 100 ordinary). Objects: To carry on the business of manufacturers, retailers, distributors, wholesalers and agents for the supply of all kinds of electrical goods and equipment, radio instruments, radio and other gramophones, &c. The directors are: J. B. W. Chapman, 17, Heathfield Road, Acton, W.3; and R. Churchman, 98, Weston Park, Hornsey, N.8. Registered office: 98, Weston Park, Hornsey, N.8.

David J. Patton (1934), Ltd.—Private company. Registered December 31st. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by the Colwell Insulating Co., Ltd. (formerly David J. Patton, Ltd.) and H. J. R. Harding, the receiver for the debenture holder of the said company, and to carry on the business of manufacturers of and dealers in ebonite, mica, micanite, vulcanite, presspahn, leatheroid, celluloid, wood, rubber, insulating sleeving, varnished cloth, armature and other tapes and insulating materials, wires, lamps, fittings, accumulators, batteries, dynamos, motors, magnetos, indicators, bells, valves, and wireless goods, appliances and accessories, electrical, mechanical and general engineers. &c. The first directors are: W. J. Dooley, 8, Orchard House, County Grove, Camberwell, S.E.5; and three others. Secretary: Miss D. M. R. Harding. Registered office: Grand Buildings, Trafalgar Square, W.C.2.

Marylebone Electric, Ltd.—Private company. Registered December 31st. Capital, £750 in 500 7½ per cent. cumulative preference shares of £1 and 5,000 ordinary shares of 1s. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The directors are: G. J. Thompson, 43, Balcombe Street, Baker Street, N.W.1; and Ada J. Thompson, 21, Balcombe Street, Baker Street, N.W.1. Registered office: 16, Melcombe Street, Baker Street, N.W.1.

D. and G. Bate, Ltd.—Private company. Registered December 28th. Capital, £1,000 in 500 7 per cent. cumulative preference shares of £1 and 10,000 ordinary of 1s. Objects: To acquire the business of Bate Bros., heretofore carried on by D. F. B. Bate and G. S. C. Bate at 33, Manchester Road, Burnley, and to carry on the business of manufacturers of, agents for and dealers in wireless apparatus, electrical fittings, &c. The first directors are: D. F. B. Bate, 165, Oxford Road, Burnley, and three others.

John Cole, Ltd.—Private company. Registered December 28th. Capital, £3,000 in £1 shares (1,500 ordinary, 1,000 7 per cent. participating preference and 500 deferred). Objects: To carry on the business of manufacturers of electrical apparatus, principally hair dryers and douches, massage vibrators, &c. The directors are: J. A. Cole, 258, Beulah Hill, S.E.19, and two others. Secretary: Mrs. E. M. Cole. Registered office: 258, Beulah Hill, Upper Norwood, S.E.19.

Crammill Electric Co., Ltd.—Private company. Registered January 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, and general electrical plant, &c. The first directors are: G. C. Mills, 244, Upper Chorlton Road, Manchester, 16, and two others. Registered office: 126, Cromwell Road, Stretford, Lancs.

W. J. Creemer, Ltd.—Private company. Registered January 2nd. Capital, £3,000 in £1 shares. Objects: To carry on the business of electrical contractors, electricians, radio dealers and manufacturers, mechanical engineers and manufacturers, &c. The subscribers are: Hettie Isaacs, 3, Dumfries Place, Cardiff; and E. A. Hayward, 44, Llanishen Street, Cardiff. Solicitors: C. James Hardwicke & Co., 3, Dumfries Place, Cardiff.

Isle of Thanet Broadcast Relay Service, Ltd.—Private company. Registered December 31st. Nominal capital, £30,000 in 15,000 6 per cent. redeemable cumulative preference shares of £1 each and 300,000 ordinary shares of 1s. each. Objects: To adopt an agreement with Broadcast Relay Service, Ltd., in relation to certain broadcast relay undertakings in and about the areas of Broadstairs, Margate and Ramsgate; and to establish, maintain and develop services for the relaying of broadcast programmes in the Isle of Thanet. The first directors are: Sir Herbert B. Grotrian, Bt., Knolls, Leighton Buzzard, Beds, and three others. Secretary: W. C. Thornton Cran. Registered office: Bush House, Aldwych, W.C.2.

Relay Systems (Johnstone), Ltd.—Private company. Registered in Edinburgh January 3rd. Capital, £5,000 in £1 shares. Objects: To acquire the business, interest and obligations of Robert Peacock, jun., of 182, Trongate, Glasgow, C.1, and to carry on the business of a radio relay system, &c. The directors are: R. Peacock, jun., 24, Bridge Street, Rothesay, and W. E. Reid, 14, Bridge Street, Hawick. Registered office: 19, Walkinshaw Street, Johnstone.

Vincent's (Radio & Electrical), Ltd.—Private company. Registered January 1st. Capital, £500 in £1 shares. Objects: To acquire the business of a radio and electrical engineer, carried on by C. G. Vincent, at 75, Station Road, Addlestone, Surrey. The first directors are: C. G. Vincent, "Wynchlands," Walton Bridge Road, Shepperton, Middlesex, and L. E. Vincent, 75, Station Road, Addlestone, Surrey. Registered office: 75, Station Road, Addlestone.

Graham's Radio, Ltd.—Private company. Registered December 24th. Capital, £1,000 in 800 ordinary shares of £1 each and 4,000 founders' shares of 1s. each. Objects: To carry on the business of merchants and manufacturers of and agents for apparatus, instruments, appliances and accessories used for lighting, heating, freezing, telegraphy, telephony and television, gramophones, &c. D. Grabow, 45, Litchfield Way, Golders Green, N.W.11, is permanent governing director and chairman. Registered office: 16, Holloway Arcade, N.7.

Efficiency Assembling, Ltd.—Private company. Registered December 15th. Capital, £100 in 10s. shares. Objects: To carry on the business of manufacturers and/or merchants of radio

apparatus, equipment and all component parts, &c. The first directors are G. R. O. Saunders, 183, Pear Tree Lane, Welwyn Garden City, and W. S. Lipman, 119, Broadhurst Gardens, N.W.6. Registered office: 45, Ludgate Hill, E.C.4.

Lumolite, Ltd.—Private company. Registered November 28th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and suppliers of incandescent and electric lights, &c. The subscribers are: J. Ismay, Roden Street Works, Ilford, Essex; and T. S. Cornwall, 10, Warwick Gardens, Ilford, Essex. J. Ismay signs as director.

Tungsten Industrial Products, Ltd.—Private company. Registered December 5th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of tungsten and other rare metal products, instruments, appliances and apparatus used in connection with the electrical and mechanical trades, &c. The first director is H. W. Pope, 38, Wood End Park Circle, Hayes, Middlesex. Registered office: 17, Southampton Street, W.C.1.

Tungsten Electric Co., Ltd.—Private company. Registered January 3rd. Capital, £100 in £1 shares. Objects: To carry on the business of refiners, manufacturers, importers and exporters of tungsten, molybdenum and refractory metals and their alloys and carbides, &c. H. W. Pope, 38, Wood End Park Circle, Hayes, Middlesex, is the first director. Registered office: 17, Southampton Street, W.C.1.

Ultra Moderne Radio & Electrical, Ltd.—Private company. Registered December 13th. Capital, £100 in £1 shares. Objects: To carry on the business of radio and electrical dealers in all its branches. H. Davis, 26, Highfield Gardens, Golders Green, N.W.11, is first director. Registered office: Ling House, South Street, E.C.2.

Robot Radio, Ltd.—Private company. Registered December 24th. Capital, £100 in £1 shares. Objects: To carry on the business of car lighting specialists, motor and radio engineers, manufacturers of and dealers in motor cars and accessories, lamps, wireless goods, batteries and electrical accessories, dynamos, magnetos, &c. The first directors are: J. Roberts and Mrs. Mary Roberts, both of 5, Sandleigh Avenue, Withington, Manchester. Registered office: 1 & 3, Bridgewater Viaduct, Knott Mill, Manchester.

Returns of Electrical Companies

English Electric Co., Ltd.—A debenture dated December 14th, 1934, to secure £375,000, charged on the company's undertaking and property, present and future, including uncalled capital, has been registered. The charge shall as regards (a) freeholds and leaseholds, with all buildings, plant and machinery thereon, and goodwill, and (b) all instalments and sums to become payable to the company by the Polish State Railways in pursuance of a construction and finance contract dated August 2nd, 1933 (except such part thereof as the company agreed to sell to British and Foreign Utilities Development Corporation, Ltd., by agreement dated March 27th, 1934), together with the benefit of the guarantee thereof by the Export Credits Guarantee Department of the Board of Trade, be a specific charge, and as regards the remaining assets be a floating charge, but so that the company is not to create any charge on any of its property in priority to or *pari passu* with this debenture, or to dispose of any freehold, leasehold or immovable property without the debenture holders' consent (such consent not to be withheld to a sale or disposition of any property comprised in the trust deed dated December 15th, 1919, made in accordance with the provisions therein). The charges created by this debenture rank behind and subject to the trust deed dated September 15th, 1919 (as modified by deed dated June 17th, 1930), securing the outstanding 5½ per cent. sinking fund first mortgage debentures, but in priority to the trust deed dated August 14th, 1923 (as modified by deed dated June 17th, 1930) securing the outstanding 6 per cent. debenture stock and any further debenture stock hereafter issued *pari passu* therewith. Holders: Lloyds Bank City Office Nominees, Ltd.

B.E.T. Electricity Supply Co., Ltd.—Particulars have been filed of debenture stock to secure £350,000, and such further stock as the company may hereafter create and issue up to a total not exceeding the nominal capital of the company then issued less (a) the amount then secured by all mortgages, charges and liens (other than the stock) ranking in priority to or *pari passu* with the security constituted by the trust deed and (b) the amount then remaining undischarged of all moneys borrowed or raised by the company's subsidiaries, excluding the amount of any debentures or debenture stock of any such subsidiary company in the ownership of or any debt due by any such subsidiary company to the company, and a premium of 2 per cent. The debenture stock was authorised on December 12th, 1934, and is covered by a trust deed of the same date. The amount of the present issue is £350,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Trustees: United States Debenture Corporation, Ltd., 52, Cornhill, E.C.

West Gloucestershire Power Co., Ltd.—Satisfaction to the extent of £510,000 on December 12th, 1934, of trust deed dated June 25th, 1924, and registered June 27th, 1924. (According to the register of mortgages, the trust deed registered June 27th, 1924, originally secured £600,000 debenture stock.)

Issues between February 7th, 1929, and February 19th, 1931, of £210,000 debentures, parts of a series already registered. Notice filed December 22nd, 1934.

Metropolitan Rediffusion Services, Ltd.—Particulars filed of £10,000 debentures authorised November 20th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £4,950.

Witton-James, Ltd.—Satisfaction to the extent of £14,000 on December 5th, 1934, of series of debentures authorised by resolution dated January 18th, 1932, and registered February 17th, 1932. (According to the register of mortgages, the series of debentures registered February 17th, 1932, originally secured £14,000.)

Wembley Relay Service, Ltd.—Particulars filed of £5,000 debentures authorised November 23rd, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,800.

Northern Batteries, Ltd.—Agreement to issue debenture dated December 6th, 1934, to secure £1,000, charged on the company's undertaking and property, present and future. Holders: North Eastern Electric Supply Company, Ltd., Carliol House, Newcastle-on-Tyne. J. Miller, 16, Market Street, Newcastle-on-Tyne, was appointed receiver and manager on December 21st, 1934, under powers contained in debentures dated July 4th, 1933.

Regentone, Ltd.—Satisfaction to the extent of £3,000 on December 21st, 1934, of debentures authorised December 4th, 1934, and registered December 6th, 1934. (According to the register of mortgages, the debentures registered December 6th, 1934, originally secured £10,000.)

Tubelight Sales, Ltd.—The nominal capital has been increased by the addition of £4,900 in £1 ordinary shares beyond the registered capital of £100.

High Vacuum Valve Co., Ltd.—Satisfaction in full on November 12th, 1934, of two debentures dated March 30th, 1931 and April 18th, 1932, and registered March 31st, 1931, and April 20th, 1932, respectively, each securing £1,932 10s.

City Notes

The Adelaide Electric Supply Co. reports a net profit for the year ended August 31st last of £379,095, as compared with £346,191 in the preceding year. The total ordinary distribution for the year is 10 per cent., against 8½ per cent., general reserve receives £5,000 (against nil), and the balance carried forward is increased from £33,126 to £92,004. The number of consumers increased during the year from 83,827 to 85,753, and the sales of electricity totalled 74,171,000 kWh, an increase of nearly ten million kWh. Reductions in the tariffs to consumers, estimated at £53,000 per annum, were made, though the reductions were not operative for a full year. The report states that further reductions are under consideration.

Westinghouse Brake & Saxby Signal Co., in a preliminary statement, reports a profit for the year ended September 30th last of £23,615, as compared with a loss of £25,508 in the preceding year. It is proposed to pay a dividend of 2½ per cent. (against nil), and to carry forward £4,193.

Murex, Ltd., is holding an extraordinary meeting on January 28th at which resolutions will be submitted sanctioning the capitalisation of £270,000 forming part of the general reserve fund, and the issue by way of bonus of one fully-paid ordinary share of 10s. for every ordinary share held. The 10s. shares, as increased in total by the bonus, will be consolidated into £1 shares.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—The Brook Radio Co., Ltd.; Cleveland Radio Co., Ltd.; Electrical & Radio Distributors, Ltd.; Etherlink Radio, Ltd.; F. B. J. Radio Products, Ltd.; F. G. F. Electrical Co., Ltd.; "Jiffy" Electric Water Heater Co., Ltd.; Plus-Four Radio Co., Ltd.; Vesta Electrical Co., Ltd.; Willis Radio, Ltd.

The Traction & General Investment Trust has recommended a final dividend on the ordinary stock of 6½ per cent., making 10½ per cent. for the year (against 10 per cent.).

Stocks and Shares

TUESDAY EVENING.

THE first week or so of the New Year is behaving in a very friendly fashion to holders of Stock Exchange securities, more especially those which are concerned with the investment markets. The turn of the year released fresh streams of money; none of the markets in which investment securities are negotiated was overlooked in the volume of buying orders that came into the House, and to meet which the supply of stock available has proved scarcely adequate. Borrowers are doing their best to provide channels for the employment of the capital, and are finding it extraordinarily easy to get such terms as, twelve months ago, would hardly have been deemed within the pale of practical politics. It would appear certain that the credit of the country is moving on to a 2½ per cent. basis. From some stocks even this rate is not obtainable. For short term loans the investor receives so meagre a rate as to make it almost negligible. A Scottish Town Council is said to have raised a loan in London of £100,000 at the rate of ½ per cent. per annum, the money being repayable in May.

Public Boards

London Passenger Transport "A" and "B" stocks are both higher, the 4½ per cent. "A" advancing to 126½, the 5 per cent. "B" stock to 128½. The Board's 5 per cent. "A" stock at 136 stands at the highest yet recorded. On the other hand, the "C" stock has receded 2 points to 98. It is surmised that the rapid rise of the price, into three figures, tempted out some of the stock which, according to report, had been held back in the estate of a large holder recently deceased. Central Electricity stocks are unchanged on the week. London & Home Counties 4½ per cent. stock is quoted ex dividend.

Cables and Wireless

The improvements in the preference and the 7½ per cent. "A" ordinary stocks of Cables & Wireless mark a reflection of the generally better tendency which prevails round the Stock Exchange for speculative as well as investment securities. Business in the stocks is comparatively small, but the firm tendency of the prices is sympathetic with that shown by other similar issues round the markets. Globe Telegraph &

Trust ordinary hold their rise at 11¼. Marconi Marines have strengthened to 35s. The transatlantic stocks are steady, showing no particular change. American Telephone & Telegraphs are harder at 107½, and Internationals at 10⅛ are practically the same as they were a week ago.

Manufacturing and Equipment

The General Electric Company is increasing its capital by the creation of two million ordinary shares, the money being required in part for the payment of the company's debenture stock. Lively interest awaits the issue of further particulars. These will be announced almost immediately. Anticipation looks for a new issue of ordinary shares on the basis of 47s. 6d., but feels uncertain whether they will be confined to shareholders only or if they will be offered to the general public through the medium of a prospectus. In the meantime, the present ordinary shares are 9d. up at 50s. 9d., the 6½ per cent. preference remaining at 32s. 6d. Crompton Parkinsons are quoted ex the bonus, the latter being valued at about 2s. per old share. Old and new are both standing at 36s. British Insulated are better at 77s. 6d. Johnson & Phillips strengthened to 30s. Reyrolle remain steady at 58s. 9d. Henleys are a shade easier at 6¾, Callenders ⅛ harder at 3⅞. Business in Ever-Ready shares continues animated, and the price is firm at 23s. 6d. Ericsson Telephones have had a jump to 5⅞. The company is largely interested in the automatic telephone business and it is doing, at the present time, a very big business.

British Aluminium

British Aluminium shares are now quoted with two different prices, the old shares being 31s., the new 29s. The new carry less dividend than the old, but allowing for this, the discrepancy is unduly wide, and although it may not pay a holder of the old shares to sell with a view to replacing his interests with new shares, owing to the expense which would thereby be involved, the prospective buyer should choose the new shares rather than the old, as being the cheaper. The company is redeeming what is left over of the 5 per cent. debenture stock, which holders who had the right to convert it did not exchange. Next New Year's Day, the company will pay off the stock at 103. This, added to the interest instalments, will be equal to 106⅞ altogether. The stock can be sold in the market to-day at this price. The stockholder, who will be obliged to take the money next January, can, if he chooses, cash his stock now for the same amount, and reinvest the money in something else.

Dollar Stocks

President Roosevelt has now announced his long-awaited policy in regard to the financing of his country's Budget. Huge deficits are provided for in the next two years, and, although the mere handling of such colossal figures as the President disclosed is enough to make the average imagination boggle, it is thought in London that the President's plans are conceived on lines which must be construed as somewhat reckless, not to say rash. He places implicit trust in the future of his country, relying upon its recuperative power to bring it safely through a period of expenditure which stretches in front of it. The effect of the speech was to bring about a slight dullness in the prices of American industrial shares, though not of any such consequence as to call for more than passing comment.

Electricity Supply Investments

A Stock Exchange firm of brokers has issued this week a brochure entitled "Shares of Electricity Supply Companies as Investments for 1935." The book gives details of the principal companies engaged in supplying electric current in Great Britain, and points out that there were decreases in dividends last year. Four companies issued rights in the shape of new shares at prices lower than prevailed in the market for the existing shares. These were the Edmundson's, Metropolitan, North Metropolitan and Scottish Power. The Electrical Distribution of Yorkshire also allotted one 6 per cent. preference share at 24s. for every five ordinary shares held. Regarded from the dividend point of view, these new issues, taken with the dividends paid, gave the shareholders 5 per cent., with the exception of Edmundson's, where the proprietor was fortunate enough to get nearly 7 per cent. The question is asked as to whether it is too much to suggest that, when trade revives, and the purchasing power of the public increases, electricity supply companies will make still further strides at a rapid pace, and the answer is shown to be in the affirmative.

Miscellaneous Matters

Iron, coal and steel shares have attracted further investment attention in consequence of the expansion of trade. A good deal of interest is being taken by the speculative investor in the shares of such companies as are likely to show improved results for the current year. In the rubber market, also, a harder tendency is noticeable. The Americans have started to buy rubber again, with the result that the price of the raw produce has strengthened, bringing with it a better tone in the Stock Exchange market for the shares of the producing companies. The stocks and shares of Home traction undertakings are in favour. British Electric Traction deferred is 35 points up, and the preferred has gained 2.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Jan. 8.	Rise or Fall.	Yield. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	79/6	+9	3 15 5
Brompton Ordinary	1	7	7	36/-	—	3 17 9
Charing Cross Ordinary	1	7	7	36/-	—	3 17 9
Chelsea	1	7	7	36/-	—	3 17 9
City of London	1	7½	7½	38/6	—	3 18 0
Clyde Valley	1	7	7	42/-	+6d.	3 6 8
County of London...	1	10½	10½	58/-	+1/-	3 12 4
Edmundson's 7% Pref.	1	7	7	37/-	—	3 15 8
Elec. Dis. Yorkshire	1	9	9	50/6	+6d.	3 11 3
Elec. Supply Corporation ...	1	11	11	58/3	—	3 15 7
Kensington Ordinary	1	7	7	36/-	—	3 17 9
Lancs Light and Power	1	7	7½	39/-	+6d.	3 17 0
London Electric	1	7	7	36/6	−6d.	3 16 8
Metropolitan	1	10	10	55/-	+6d.	3 12 7
Midland Counties	1	7	7	39/-	+6d.	3 11 9
Mid. Elec. Power	1	8	8	48/9	+⅛	3 5 7
North Eastern Electric Ordinary	1	6	6	34/6	+1/-	3 9 7
Do. 7% Pref.	1	7	7	35/6	—	3 19 0
Northampton	1	10	10	57/6	—	3 9 6
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	65/-	+6d.	3 1 6
Do. do. 6% Pref.	1	6	6	32/6	—	3 13 10
St. James' and Pall Mall ...	1	7	7½	38/-	−6d.	3 19 0
Scottish Power	1	8	8	44/-	+1/-	3 12 9
South London	1	7	7	36/-	—	3 17 9
Westminster Ordinary	1	7	7	36/6	—	3 16 9
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/6	—	6 13 4
Yorkshire Elec.	1	8	8	48/-	—	3 6 8
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	117	—	4 5 6
Do. 1955–75 ...	„	5	5	110	—	4 4 0
Do. 1951–73 ...	„	4½	4½	110	—	4 1 10
Do. 1963–93 ...	„	—	3½	102	—	3 8 8
London & Home Counties, 1955–75	„	4½	4½	113xd	—	3 19 8
London Passenger Transport, A...	„	—	4½	126½	+2	3 11 2
Do. do. B...	„	—	5	128½	+1	3 18 0
Do. do. C...	„	—	3	98	−2	3 1 2
West Midlands Joint Elec. 1948–68	„	—	5	118	—	4 4 9
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	107½	+1	8 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	122	—	4 18 4
Do. Def.	„	1½	1½	31	—	4 16 9
Cables & Wireless 5½% Pref. ...	„	2¾	2¾	83½	+½	3 5 10
Do. A. 7½% Ord.	„	Nil	Nil	19	+½	—
Do. B. Ord.	„	Nil	Nil	7	—	—
Globe Tel. and T. Ord.	10	Nil	2½	11½	—	2 4 5
Do. do. Pref.	10	6	6	13⅜	—	4 8 0
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	35/-	+⅛	4 5 9
Oriental Telephone Ord.	1	12	12	3¼	—	*3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	935	+35	—
Do. do. Pref. Ord.	„	8	8	170½	+2	4 14 0
Brazil Traction	100	—	—	10⅜	−⅛	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	109½	+1½	4 11 4
Mexico Trams, 5% Bonds ...	—	5	5	19½	—	—
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds...	—	5	5	48	+3	—
Victoria Falls Ord.	1	15	20	7⅝	+⅛	2 15 6
Yorkshire (West Riding) ...	1	2½	5	26/3	—	3 16 2
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	68/9xd	—	2 17 6
Assoc. Elec. Ord.	1	4	3	24/6	—	2 9 0
Do. Prf.	1	8	8	36/3	—	4 8 3
Babcock & Wilcox	1	9	6	47/6	+½	2 10 4
British Aluminium Ord.	1	5	5	31/-	+2/3	3 4 7
British Insulated Ord.	1	5	15	77/6	+6d.	3 17 4
Brush Ord.	Stock	N 1	Nil	40½	+2½	—
Callender's	1	15	15	3⅝	+⅛	4 8 8
Do. 6½% Pref.	1	6½	6½	32/6	+6d.	4 0 0
Crompton Parkinson Ord. ...	5/-	22	12½	36/-	—	1 14 10
Do. 8% Pref.	1	8	8	35/-	—	4 11 5
Edison-Swan 1st Pref.	1	7½	7½	23/9xd	+6d.	6 6 4
Electric Construction	1	Nil	Nil	15/-	—	—
Enfield Cable Ord.	1	25	20	4¾	+⅛	4 2 0
English Electric	1	Nil	Nil	7/-	−6d.	—
Do. do. Pref.	1	Nil	Nil	12/-	+9d.	—
Ever Ready	5/-	35	35	23/6	—	7 9 0
Ferranti Pref.	1	7	7	29/6xd	—	4 15 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	50/9	+9d.	3 3 0
Henley's	1	30	30	6¾	−⅛	4 8 9
Do. 4½% Pref....	5	4½	4½	5⅝	—	3 16 8
India-Rubber Preferred	1	—	—	1⅛	—	—
Johnson & Phillips	1	5	5	30/-	+1/9	3 6 8
Siemens Ord.	1	6½	4	20/9	+9d.	3 17 1
Telegraph Construction	£1	Nil	Nil	1⅛	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

5140. "Cooled and shielded spark-plugs." Hurley-Townsend Corporation. March 7th, 1932. (421048.)

10346. "Alternating-current frequency-changing systems." International General Electric Co., Inc. April 11th, 1932. (420902.)

13842. "Cathode-ray tubes." Radioakt-Ges. D. S. Loewe and K. Schlesinger. May 14th, 1932. (Cognate application 13843/33.) (421050.)

13931. "Cathode arrangement for Braun tubes." Radioakt-Ges. D. S. Loewe and K. Schlesinger. May 14th, 1932. (Cognate applications 13932/33 and 13933/33.) (421051.)

15849. "Electric tumbler switches." R. W. L. A. Ham. June 1st, 1933. (420905.)

16133. "Dry primary batteries." J. A. McKee, R. S. Scott and R. A. McKee. June 6th, 1933. (421053.)

16163. "Order-telegraph apparatus particularly for ships and the like." Mechans, Ltd., and G. W. Hastings. June 6th, 1933. (420910.)

16268. "Thermionic amplifiers and rectifiers of electrical oscillations." Telefunken Ges. für Drahtlose Telegraphie. June 4th, 1932. (420911.)

16480. "Electrical power plant." G. M. Pestarini. June 8th, 1933. (420979.)

16576. "Imitation fuel for electric fires." H. H. Berry. June 9th, 1933. (421057.)

16580. "Electric-arc welding." British Thomson-Houston Co., Ltd. June 21st, 1932. (421179.)

16651. "Devices for recording and reproducing telephonic messages." P. C. Ricchiardi. June 11th, 1932. (421059.)

16654. "Protective apparatus for electrical systems." British Thomson-Houston Co., Ltd. June 11th, 1932. (421060.)

16683. "Regenerative braking with valve-controlled alternating-current motors." Akt.-Ges. Brown, Boveri et Cie. June 22nd, 1932. (421061.)

16901. "Means for supporting cathode-ray tubes." T. E. Bray and Baird Television, Ltd. June 13th, 1933. (421065.)

16997. "Safety apparatus for controlling electric railway locomotives and vehicles." International General Electric Co., Inc. June 15th, 1932. (421067.)

17009. "Electric couplings." C. R. Cook. June 14th, 1933. (Addition to 403448.) (421128.)

17022. "Frequency-transforming arrangements." Telefonaktiebolaget L. M. Ericsson. June 14th, 1932. (421129.)

17103. "Thermionic-valve circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. June 15th, 1932. (Addition to 418132.) (421182.)

17109. "Electric motor control systems." British Thomson-Houston Co., Ltd., and H. F. Jefferson. June 15th, 1933. (421183.)

17110. "Electric relays." British Thomson-Houston Co., Ltd., H. W. Taylor and C. Stewart. June 15th, 1933. (421184.)

17148. "Electrical switching devices for use upon vehicles and craft automatically operable on collision or overturning." H. M. Salmond. June 15th, 1933. (421185.)

17155. "Thermionic-valve circuits." Telefonaktiebolaget L. M. Ericsson. June 16th, 1932. (421186.)

17264. "Thermionic-tube amplifiers." J. J. Numans. June 16th. 1932. (421189.)

17326. "Telephone or like receivers and headbands therefor." Standard Telephones & Cables, Ltd., B. B. Grace and J. S. P. Robertson. June 17th, 1933. (421192.)

17412. "Electric-current rectifiers." Ruben Rectifier Corporation. June 18th, 1932. (Cognate application 17413/33.) (421136.)

17641. "Snap-action electrical switches of the enclosed or ironclad type." Simplex Electric Co., Ltd., P. W. Davis and W. E. Hill. June 21st, 1933. (421069.)

18153. "Electron-discharge devices." G. D. O'Neill. June 30th. 1932. (420988.)

18953. "Directional lighting fittings." General Electric Co., Ltd., and S. S. Beggs. July 4th, 1933. (420992.)

19089. "Street-lighting apparatus." Holophane, Ltd., and S. English. July 5th, 1933. (420922.)

19102. "Electric discharge tubes." A. H. Brackensey and Franco-British Electrical Co., Ltd. July 5th, 1933. (421071.)

19602. "Magneto-electric machines especially for internal-combustion engines." J. Bohli and G. Steiner. July 11th, 1933. (Addition to 413716.) (421198.)

20017. "Flexible multicore electric cables." Pirelli-General Cable Works, Ltd., and J. L. Bishop. July 14th, 1933. (421073.)

21248. "Method of using maximum demand-indicators and ampere-hour meters." Allen West & Co., Ltd., and R. P. Bossom. July 28th, 1933. (421200.)

21374. "Electric torch and like battery containers." C. H. Keeler. July 29th, 1933. (420997.)

21524. "Methods of manufacturing cathode-ray tubes and like apparatus." Marconi's Wireless Telegraph Co., Ltd. July 30th, 1932. (421201.)

21842. "Galvanic batteries." Oldham & Son, Ltd., and T. G. Mair. August 3rd, 1933. (420999.)

22179. "Electric storage cookers." General Electric Co., Ltd., O. W. Humphreys and C. W. Stopford. August 8th, 1933. (421203.)

22626. "Automatic volume control in radio receiving sets." E. K. Cole, Ltd., and G. Bradfield. August 14th, 1933. (421075.)

22988. "Single-phase capacitor type induction motors." English Electric Co., Ltd., R. D. Ball and C. T. Scarf. August 17th, 1933. (421206.)

23268. "Electrical equipments for lifts, hoists, and the like." G. M. Pestarini. August 21st, 1933. (421002.)

23638. "Electric fuses and cut-outs." British Brass Fittings, Ltd., and G. N. Sperryn. August 25th, 1933. (421208.)

24234. "Vacuum electric apparatus." C. Sykes, L. H. J. Phillips, C. H. Walker and Associated Electrical Industries, Ltd. August 31st, 1933. (421209.)

24968. "Electric coupling means for the sparking-plugs of internal-combustion engines." Bristol Aeroplane Co., Ltd., and A. H. R. Fedden. September 8th, 1933. (Cognate applications, 35478-33 and 22707-34.) (421211.)

25156. "Systems for transmitting a plurality of sound effects simultaneously." Western Electric Co., Ltd. (Electrical Research Products, Inc.). September 11th, 1933. (421212.)

25989. "Alternating-current rectifying systems." British Thomson-Houston Co., Ltd. September 20th, 1932. (421008.)

27738. "Electric lighting system for electrically driven road vehicles." G. E. Liardet & Simms Motor Units, Ltd. October 9th, 1933. (421215.)

30367. "Sound-amplifying devices." M. Iwasa. November 3rd, 1932. (421012.)

30406. "Modulated high-frequency transmitters." Telefunken Ges. für Drahtlose Telegraphie. November 1st, 1932. (420013.)

30848. "Stands for Röntgen apparatus." E. Pohl. November 5th, 1932. (Cognate application 30849-33.) (420938.)

31967. "Modifying the power factor in electrical-discharge appliances with grid control." Akt-Ges. Brown Boveri et Cie. December 24th, 1932. (421221.)

33508. "Telegraph receivers." H. Fuld & Co. Telephon-und Telegraphen-werke Akt.-Ges. November 30th, 1932. (421227.)

1934

32. "Methods of encasing wound condensers." J. Bohli. December 30th, 1932. (421086.)

344. "Trunk-cable installations." Siemens & Halske Akt-Ges. January 4th, 1933. (Cognate application 345-34.) (421232.)

1858. "Electric heating soldering of welding tongs or pincers." R. C. Gstalder. January 18th, 1933. (421019.)

2693. "Electric-lighting installations for vehicles." R. Bosch Akt.-Ges. February 1st, 1933. (420946.)

4656. "Method of indicating a predetermined path in space by means of short waves, particularly ultra-short electromagnetic waves." Naamlooze Vennootschap Machinerien-en Apparaten Fabrieken. February 10th, 1933. (421092.)

10324. "Traction motors of electrically-driven vehicles." W. S. Graff-Baker. April 5th, 1934. (421240.)

13387. "Means for measuring vacuum, especially in electric discharge apparatus." Allmänna Svenska Elektriska Aktiebolaget. May 4th, 1933. (420958.)

13509. "Electric clocks." F. Marti, A. Strahm and E. Boss. May 4th, 1933. (420959.)

15699. "Supervisory control and signalling systems." Westinghouse Electric & Manufacturing Co. April 15th, 1932. (Divided application on 10978-33.) (421242.)

15992. "Metallic-vapour arc convertors." English Electric Co., Ltd. August 2nd, 1933. (421109.)

17745. "Radioactive sparking-plugs." J. A. R. D'Aiguillon. June 16th, 1933. (421161.)

17764. "Optical position indicators for electric switches." British Thomson-Houston Co., Ltd. June 15th, 1933. (421162.)

20484. "Lighting fixtures for electric gaseous discharge lamps." British-Thomson Houston Co., Ltd. August 18th, 1933. (421042.)

20955. "Electromagnets." British Thomson-Houston Co., Ltd., July 21st, 1933. (421164.)

21150. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 6th, 1933. (Addition to 392796.) (421043.)

26668. "Electric incandescent lamps." General Electric Co., Ltd. December 8th, 1933. (421045.)

33394. "Cooled and shielded sparking-plugs." Hurley-Townsend Corporation. March 7th, 1932. (Divided application on 5140-33.) (421245.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 2nd:—

Panohmer. No. 554200. Class 8. Instruments for measuring the electrical conductivity of solutions.—Mirrlees-Watson Co., Ltd., 45, Scotland Street, Glasgow.

Salora Lights Like The Sun (lettering and design). No. 554353. Class 8. Searchlight apparatus, and lamps for scientific purposes. No. 554354. Class 13. Lamps (ordinary) and electric lamp switches, &c.—Salora Lights, Ltd., 52-53, Guildhall Buildings, Navigation Street, Birmingham.

Neolume. No. 552693. Class 8. Electrically illuminated advertising signs.—Neon Illuminants, Ltd., 72, Hanover Street, Liverpool.

Telematic. No. 553675. Class 8. Telephonic apparatus and parts thereof.—Telephone Rentals, Ltd., Hollingsworth Works, Martell Road, West Dulwich, S.E.21.

Curlyne. No. 554421. Class 18. Electric heating stoves for buildings.—John Lightfoot, Ltd., 219, Oxford Road, Manchester.

The Suggestion for a Larger Unit

With reference to the letter from Mr. D. J. Bolton in our issue of December 14th, in which it was suggested that there was a need for a larger unit of electricity than the kilowatt-hour, the author has communicated with us advocating the use of the word "big kelvin" (which he believes would soon lose the adjective) to denote an amount ten times that of the existing standard. His choice is, we consider, an unfortunate one. The name of Lord Kelvin is already associated with the relations between energy losses and capital charges on cables and between electricity and temperature differences, as well as with the balance of electro-magnetic forces against gravity. A more serious objection, however, is that the word is included in the British Standard Glossary as a permitted variant of the kilowatt-hour, representing 3,415 B.th.u., and to alter its international value would cause greater confusion than that which led to the falling out of use of "B.T.U." as being too similar to B.th.u.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—School, Park housing site, for Borough E.C.; borough surveyor.

Bilston.—Houses (108), Bradley Lodge Estate, and 20 houses, Market Street; housing architect.

Birmingham.—Baths, Acock's Green, and nurses' accommodation, Dudley Road Hospital (£9,682); city engineer.

Blaina.—Tar macadam works, for William Prestwich & Sons, Ltd., Old Hill, Blackheath, near Birmingham.

Bootle.—Workshops, &c., Linacre Lane (£2,510); Leyland Construction Co., Ltd.

Boreham Wood.—Cinema, Shenley Road (1,200 seats); Tudor Theatre (Elstree), Ltd.

Bradford (YORKSHIRE).—Houses (441), Haworth Road and Stony Ridge; M. Procter, builder, Westfield Park Estate, Haworth Road. Nurses' home, St. Luke's Hospital; borough engineer, Town Hall. Extensions to works, Wakefield Road, for Hepworth & Grandage, Ltd., St. John's Works; M. Booth & Son, builders, Acomb Street.

Bridlington.—Houses (42); Jaques & Greeves, Ltd., builders, Doncaster.

Brighton.—School, Patcham, for Borough E.C.; director of education.

Cambridge.—Guildhall; Mr. Cowles-Voysey, architect. Theatre, Peas Hill, for Arts Theatre of Cambridge, Ltd., Leys Avenue; secretary.

Cardiff.—Houses (800), Philog district; borough surveyor.

Castle Ward (NORTHUMBERLAND).—Houses (46); J. Jameson, Fernlea, Ponteland.

Chadderton.—Houses (40), Henley Street; Whitworth Whittaker, builder, Rochdale Road, Oldham.

Cheltenham.—Houses (150), Leckhampton Lane; J. D. Bendall & Son.

Cheshire.—School (200 places), Gatley, for County E.C.; E. A. Browne, county architect, The Castle, Chester.

Chesterfield.—Houses (37), New Whittington; borough surveyor.

Chorley.—Houses (62), Duke Street; borough surveyor.

Clacton-on-Sea.—Cinema, shops and flats, Pier Avenue and Old Road, for Eldorado Cinemas, Ltd.

Cockfosters.—Shops and flats, Heddon Court Estate; F. W. Walker.

Colchester.—Extensions to 48-9, High Street; F. W. Woolworth & Co., Ltd. Works extensions, North Station Road; Duncan Clark & Beckett, architects.

Connah's Quay.—Houses (122), Golftyn; U.D.C. housing architect.

Consett.—Bus station, with waiting rooms, &c., Market Square; U.D.C. surveyor.

Coventry.—Houses, Barras Heath and Bell Green; city surveyor.

Craven Arms (SHROPSHIRE).—Cinema, for Craven Arms Cinemas, Ltd.; secretary.

Crewe.—Additional houses, Timbrell Avenue; borough surveyor.

Dawlish.—Entertainment pavilion, Lawn Terrace; U.D.C. surveyor.

Deal.—Houses (68), Cavell Square, Mill Hill, for First National Housing Trust, Ltd.

Dewsbury.—Shops, Foundry Street; E. L. Whitworth.

Dover.—Reconstruction of business premises, with shopping arcade, for H. Hart & Co., Ltd.; R. J. Barwick, builder.

Dudley.—Houses, Marriott Road and Walker Street; J. Watchorn & Sons. Houses (50), for slum tenants; borough engineer.

Durham.—Schools, Easington Colliery, and Waterhouses; F. Willey, county architect, 34, Old Elvet.

Eastbourne.—Hotel, Burlington Place; F. C. Benz, on behalf of Mrs. E. Maloney. Houses (74), Churchdale Road, and extensions, &c., to Public Assistance Institution; borough engineer. Extensions to Princess Alice Hospital; governors.

Essex.—Senior school, Upminster (£23,619); C. Deaves, builder.

Finedon.—Installation electric lighting to Council houses; A. E. Lloyd, Town Hall.

Glamorganshire.—Secondary school, Whitchurch, Cardiff (£25,000), for County E.C.

Gloucester.—Houses, Chequers Bridge site, and Tredworth Estate; city surveyor.

Hampton.—Alterations and additions to King's Canadian school, Bushy Park; W. H. Gaze & Sons, Ltd., on behalf of L.C.C.

Harrogate.—All-electric crematorium (£7,000); borough surveyor.

Hastings.—Underground bathing stations, sports pavilion, &c. (£108,000); Mr. Little, borough engineer.

Horwich.—Houses (52), Old Lords Estate; T. Green, surveyor, Public Hall.

Hull.—Dwellings (676), Endyke Estate and Barnsley Street; city architect.

Kempston.—Houses (240), Kempston Hoo Estate; Structural Construction, Ltd., Victoria Street, London, S.W.1.

Kendal.—Cinema, Stricklandgate, for Graves' Cinemas, Maryport; Col. D. J. Mason, Whitehaven.

Kent.—Hospital block, Farnborough, for C.C.; W. H. Robinson, county architect, Springfield, Maidstone.

Leamington Spa.—Rebuilding station, for the Great Western Railway Co., Ltd.; engineer, Paddington Station, London, W.2.

Leeds.—Houses, Blue Hill Lane, Wortley; J. Thirtle. Houses, Hough Lane, Bramley; Greenside Estate Co. Houses (280) and flats, Dewsbury Road Estate (£76,852); Woolley Construction Co., Ltd. Reconstruction of Otley Road (£56,000); city engineer.

Leicester.—Houses (1,000), Braunston Hall Estate (£400,000); R. H. Simmonds, New Road, Hinckley. Houses (140), Thurmaston (£50,000); A. Curry, Fleetwood Road. Junior school, Gypsy Lane; city architect. Extensions to hospital (£7,120); G. Duxbury & Sons.

Lightcliffe (YORKSHIRE).—House and model dairy, Smith House Lane; G. R. Oddy, chartered architect, Wards End Chambers, Halifax.

Liverpool.—Church of St. Monica, Fernhill Road, and Earl Road, Bootle, for the Catholic Diocesan Authorities; F. X. Velarde, architect, 3, Abercromby Square.

London.—(SOUTHWARK).—Flats, Amery's Place, Kinglake Street (£24,587); R. J. Rowley, Ltd., Tottenham, N.17. Rebuilding, Bankside; Beck & Pollitzer.

Manchester.—Houses (140), Blackley Estate; Simms, Son & Cooke, Ltd. Houses, Brownley Green Estate, Clayton Mount, and flats, &c. (£813,525) at Collyhurst and West Gorton; city engineer. Extensions to Shirley Institute, Didsbury; Institute directors. Two schools, Wythenshawe; city engineer and St. Ambrose R.S. school trustees.

Mansfield.—Houses (52), Ravensdale Estate; borough engineer.

Market Bosworth.—Houses (200); Housing Committee.

Marlow.—Houses (38), Seymour Court Road; U.D.C. surveyor.

Merthyr Tydfil.—Alterations and additions to Mining Institute, Quaker's Yard; clerk to the Committee.

Newcastle-on-Tyne.—Conversion of Empire Theatre into shops and offices; J. R. Rutherford & Sons, builders, Minories Joinery Works, Jesmond.

Northampton.—Houses (66), St. David's Estate (£20,000); Bainbridge (Builders), Ltd., Doncaster. Houses (12), Weston Favell and Billing Road; A. Glenn & Sons, Ltd. Houses (14), White Hills Estate, Boughton; Hamson & Son, Ltd. Reconstruction of 38-40, Gold Street; F. W. Woolworth & Co., Ltd. Reconstruction of shop and offices, Wellington Street; A. R. & W. Cleaver.

Petworth (SUSSEX).—Houses (26); R.D.C. surveyor.

Plymouth.—Cinema, shops, &c.; B. C. Langford, architect, East Gate, Bank Chambers, Exeter.

Reading.—Houses (288), Greenfields Estate; First National Housing Trust, Ltd.

Rochester.—Senior school, for City E.C.; Read & McDermott, architects, 8, High Street.

Rotherham.—Extensions to public abattoir (£17,200); borough engineer.

Scarborough.—Houses (208); Mollekin Bros., builders, Maltby, Rotherham. Maternity block to Scalby Road Hospital; borough engineer.

Scunthorpe.—Stores, Ashby, for the Co-operative Society, Ltd.; W. Pallister, Ltd., builder, Crosby Road.

Seaham Harbour.—Factory for the production of oil from coal, for Coal & Allied Industries, Ltd., Leadenhall Street, London, E.C.3.

Selsdon (CROYDON).—Houses (324), Old Farleigh Road, for R. Costain, Ltd., Croydon.

Sheffield.—Houses (372), Arbourthorne Estate (scheme 3) (£114,602); W. Malthouse, Ltd. Houses (26), Essex Street; G. V. Quibell. Houses (21), Forres and Arran Roads; T. J. Sanderson. Houses (30), Hastilar Road and Mason Crescent; J. C. Mason. Houses (22), Hereward Road; Oxspring Bros. Houses (78) and shops, Knowle House Estate, Gleadless Common; W. H. Lancashire & Son. Houses (74), Lees Hall Road; W. & J. Laver. Houses (79), Richmond Road, &c.; J. F. Bullen. Reconstruction of Weston Park Museum (£26,500); Ald. J. G. Graves and city engineer.

South Shields.—Houses, Cornwallis Square, and Harton Colliery; also school, Cleadon Park Estate; borough engineer. Church, Cleadon Park Estate; Rev. H. Bamblett, St. Cuthbert's. Cinema, Dean Road; R. H. Morton, architect, for Wm. S. Shepherd.

Southgate.—School, Wades Hill; W. G. Wilson & Son.

Southport.—Extensions to King George School; Leathart & Grainger, architects. School (800 places), Meols Cop Road, for Borough E.C.; director of education.

Spennymoor.—Houses, slum clearance scheme; J. H. Gardner, surveyor, Council Offices.

Staffordshire.—Senior school, Brereton Road, Rugeley; G. C. Lowbridge, architect, county architect, County Offices, Stafford. Senior school, Sedgley (£21,617), for County E.C.; W. Higley, builder, Port Hill, Shrewsbury.

Swalecliffe (KENT).—Houses (500); Goodwin & Russell, Herne Bay.

Wakefield.—Houses (100), Council estates; housing architect.

Walsall.—Houses (300), Delves Estate, by direct labour; borough surveyor. Houses (56), Walker Road and Barracks Lane, Blakenall (£16,368); L. G. Pearce.

Warminster.—Houses (34); Terence W. Snailum, U.D.C. architect.

Warrington.—Houses (280), Alder Lane Estate; borough engineer. Houses (74), Hallfields Road, &c.; R. & S. Smith. Enlargement to bath (£5,590); W. E. Hatch & Son.

Welwyn Garden City.—Public offices (£20,000); U.D.C. surveyor.

West Riding.—Senior school, Stainforth, Thorne (560 places), for County E.C.; education architect, Wakefield.

Workington.—Houses (98), (£26,298); borough engineer.

Worthing.—Houses (50), Congreve Road; S. C. Phillips. Houses, Elizabeth Road, &c.; F. Sandell & Sons. Houses (216) and flats, Salvington Road (£85,000); borough engineer. Completion of Pier Pavilion (£11,427); J. Longley & Co., Crawley.

Yeovil.—Houses (129), Westfield Grove; borough surveyor.

York.—Houses (800), Clifton; borough surveyor. Block of flats, Lucas Avenue (£5,280); R. G. Tarran, Ltd., builders. Works extension, Wiggington Road; Rowntree & Co., Ltd.